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MAR 22 1929

INSTRUMENTS

INDUSTRIAL — SCIENTIFIC

voted to the Instrument Problems of all Industries

. 2. No. 3 Pittsburgh, Pa. March, 1929

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Portable Electrical Instruments.
W. J. HEALY, NEWARK, N. J.

The Ostwald Color Theory.
ALBERT PARSONS SACHS, NEW YORK, N. Y.

The Wilip-Galitzin Seismograph.
PROF. J. W. TYNAN, S. J., NEW YORK, N. Y.

Integration of "Orifice Head" Charts by means of Special Planimeters.
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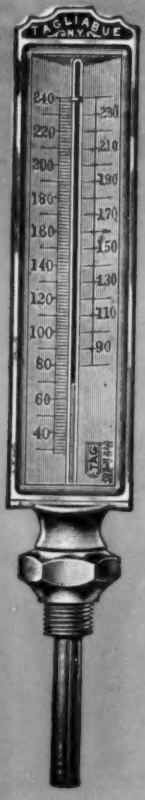

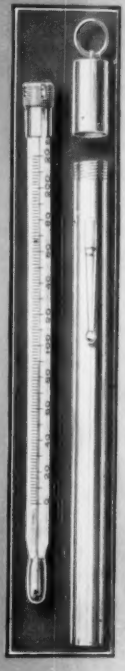

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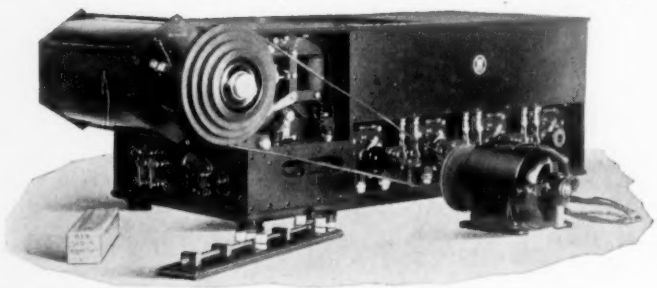

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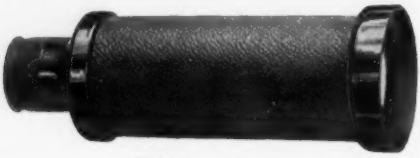

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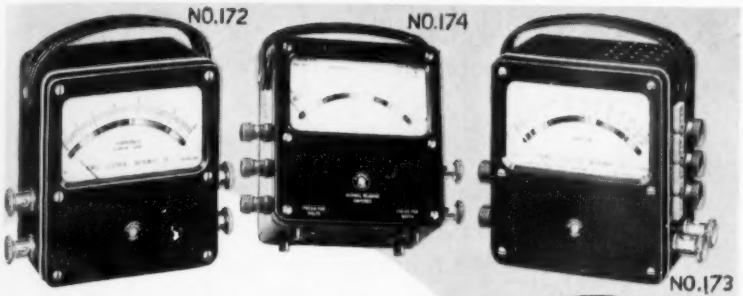

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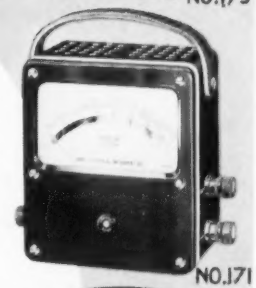

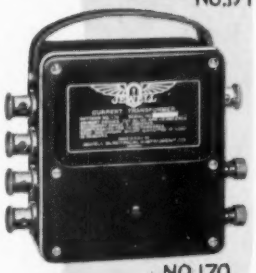

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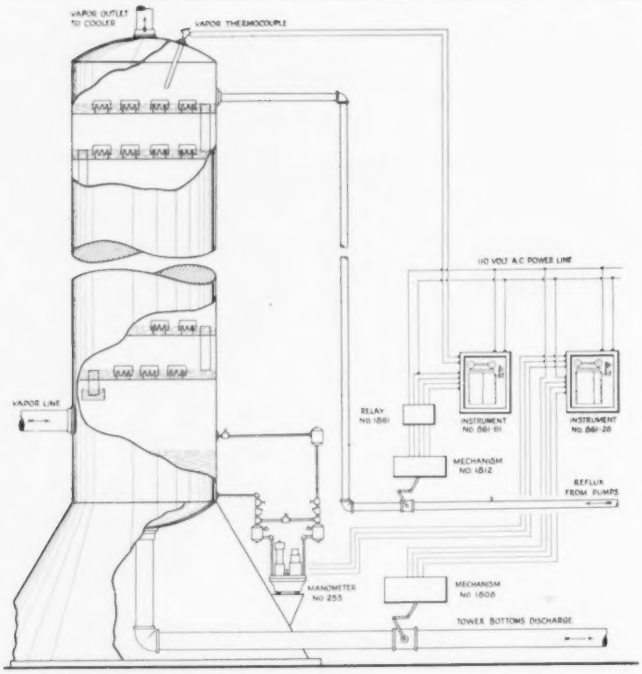

Brown engineering layout of Brown Automatic Control Recording Pyrometer and Brown Automatic Control Recording Electric Liquid Level Gauge recording and automatically controlling temperature of cooling medium and level of condensate in petroleum refining fractionating tower.

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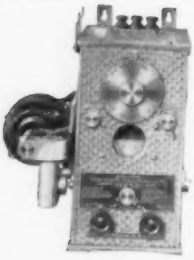
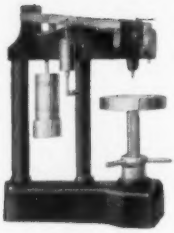
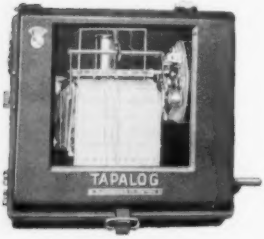
Have your stenographer cut out and mount the index found bound in the back of this issue, listing the principal articles. They will direct you to valuable information to which you may wish to refer in the future.



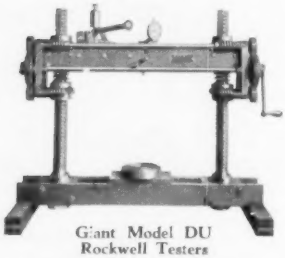
Automatic Temperature Controllers



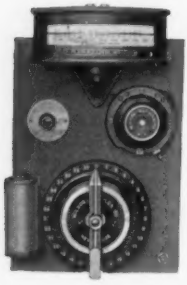
Rockwell Hardness Testers



Recording Pyrometers



Giant Model DU Rockwell Testers



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Vol. 2, No. 3 MARCH, 1929 Pittsburgh, Pa.

To Our Readers

WE are sometimes fortunate in that we are afforded the privilege to "see ourselves as others see us." The editor below quotes from a translation of a report written for the Elektrotechnischen Zeitschrift by Dr. Georg Keinath, Honorary Professor at the Technische Hochschule of Charlottenburg and Director of the instrument plant of Siemens & Halske.

NEW PUBLICATION INSTRUMENTS

In the past year an American publication for industrial and scientific instruments appeared. As it is so different from publications known heretofore, it appears desirable to make a short report on it.

The editor has followed ideas, which the author of this report expressed a number of years ago. In his own case though it did not find an intensive interest as it was in direct opposition to the make-up of the publications available.

The measuring science is an auxiliary science. Engineers can not be expected to be so well versed that they will always know the latest developments. Text books to be sure give a comprehensive picture, but can never contain the latest information. The reading of articles on new instruments and methods contained in the many periodicals can at present be done by only a very small number of the engineers, first: because they do not have all the periodicals at their disposal, and second: because they do not have the time. Articles on measuring appear in the most varied publications.

According to the opinion of the writer, it is necessary for the measuring science to have a publication, which immediately upon receipt can be taken apart and the information arranged according to a certain key or index, so that after several years, a fairly complete book on the new measuring instruments and on the latest measuring methods can be taken from these sheets. It will always be up to date and can always be supplemented. It will always be available for reference, when one is searching for a measuring method or instrument.

This idea is closely followed by the new publication INSTRUMENTS. The book is printed on heavy coated enamel stock, and well illustrated. All articles begin at the top of the right hand page and end with the left hand page, so that they, therefore, always comprise whole sheets.

The text as a rule contains first a historical-biographical article on pioneers of the instrument science, then a number of articles of a practical nature and finally a number of short descriptions of new instruments. In the appendix is a review of the new catalogues with a brief notation of the contents. In addition, new books are reviewed as well as the current literature in this field. The review of patents appears to be of little value as in addition to the name of the patentee only the title of the patent is given.

This new periodical deserves special consideration due to its remarkable make-up, above all though on account of the rich contents, which brings extensive information to every one who uses measuring instruments.

When writing to Wilson-Maeulen Co. mention INSTRUMENTS

Expose Your Friends to a Copy of Instruments

WE have printed extra copies of this issue and will be glad to send copies to you gratis to give to acquaintances who perhaps are unfamiliar with INSTRUMENTS.

———— :: ————

Get Full Value from Your Investment in Instruments

VALUABLE facts and information on instruments are filed away in technical periodicals. These articles are written by experts. The Current Literature Review in INSTRUMENTS reviews articles on instruments and devices for measurement, inspection and control, appearing in the technical literature the world over.

———— :: ————

Buyers' Guide

THE editor would like to call your attention to the Buyers' Guide. The number of items listed has been increased from 207 to 249. When writing these companies please mention INSTRUMENTS.

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Portable Electrical Instruments

*W. J. Healey**

PORTABLE instruments are used more generally for various applications than the switchboard type. The latter being installed on switchboards with care as to the selection of size, and where the quantity to be measured is not as liable to be subjected to varied conditions as portable intruments. Portable instruments are expected to give good service over a wide range of temperature conditions which not only has some effect on accuracy but are apt to impair the material and construction. It is quite essential in the designing of portable instruments that special consideration be given to insure their durability for a period of 10 to 25 years.

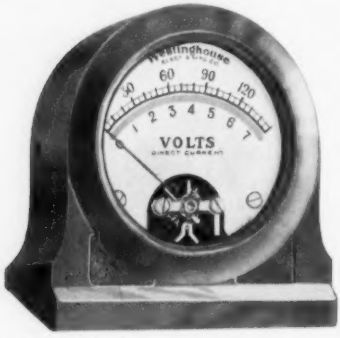
Accuracy: Greater accuracy is usually expected of portable instruments. Although accuracy is of prime importance it should not be assumed that the larger the size the greater the degree of accuracy, as a long scale and pointer only increases the readability, such as a watch or clock indicates the time. However, usually extremely small instruments are not intended to indicate as accurately as larger sizes, neither are they as high priced. A general rule may be assumed that the smaller sizes are less accurate and will withstand rougher usage, although usually the larger sizes will withstand severe overloads and rough handling but the degree of accuracy is apt to be impaired which will probably seriously affect the scale calibration. It is quite essential that special care be taken in handling and using portable instruments to insure the guaranteed accuracy as long as possible.

Application: As the variety of uses vary different sizes are desirable for economy and convenience. The size and shape of the portable instrument is particularly important. Switchboard instruments should have their calibration checked, with suitable portable instruments and if serious errors are noted a thorough inspection made to determine the cause of the error. The frequency of checking such instruments should depend on their use, age and other factors. Some companies require their entire switchboard instruments to be checked every six months, while others feel that once every two years is sufficient. The most frequent custom is to check these while installed with the circuit load or with a phantom load. A portable instrument with a scale approximately 5" long and with an accuracy of ¼% to ½% is recommended for this purpose. Some may think that one of 1% to 1½% is entirely satisfactory for most of this work. That may be correct to a certain extent, but by the use of a standard of greater accuracy, aside from being able to make more accurate checks, certain small peculiarities in the calibration can be detected and corrected which might seriously affect the calibration if al-

*Instrument Specialist, Westinghouse Electric & Manufacturing Company.

lowed to remain, probably these would not be noticed with an instrument of smaller sizes or one of less accuracy. The use of smaller sizes with scales 2″ to 3½″ long and accuracies of 2% to 3% are quite varied. General testing of motors, control circuits, signal lights, and similar work does not require instruments of any great accuracy and usually the smaller sizes are more convenient. Relay test work should be done with an instrument that will withstand momentary overloads. The accuracy need not necessarily be greater than ½% to 1%, but should maintain this accuracy, as it is quite essential when adjusting relays, especially the over-current type, that the various pick-up values and tap settings be adjusted to the correct value for the proper protection of the circuit and system.

Model 489 Voltmeter
(Weston Electrical Instrument Corp.)



PX-2 Double Range Voltmeter
(Westinghouse Electric & Mfg. Co.)

Miniature instruments are becoming more useful today, due to the increased use of small electrical devices and the broad use of appliances in the household. The contractor and electrician makes use of the miniature size for checking circuits, etc. Radio, of course, also provides a large field. It is quite simple to add special features to the miniature sizes to make them suited for a particular requirement. The simplicity of such devices and their convenience are of particular importance. The Garage and Battery Service Stations appreciate the convenience of the miniature sizes. A new device recently put on the market by one manufacturer utilizes a panel type meter mounted on a special handle provided with a spike point and flexible lead to which is attached another spike tip handle

Panel Mounting Voltmeter
(Westinghouse Electric & Mfg. Co.)

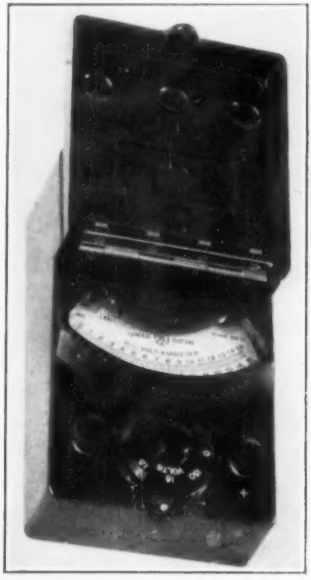
Cadmium Test Battery Voltmeter
(Hoyt Electrical Instrument Works)

car or radio or opening up the cell.

Construction: The construction of an instrument, like any other apparatus, determines to a large extent its life. To obtain greater accuracy in the large size certain refinements are essential. The quality and construction of the jewels and pivots are important factors. Usually the pivots are sharply pointed or have a small angular radius. Since most portable instruments are used in a horizontal position the moving element rests and turns on one point, hence the rolling friction is a minimum. The other pivot and jewel are used more as a guide to keep the element in alignment, which is an important factor in maintaining accuracy and scale distribution. Sapphire is most commonly

PX-4 Volt-Ammeter
(Westinghouse Electric & Mfg. Co.)

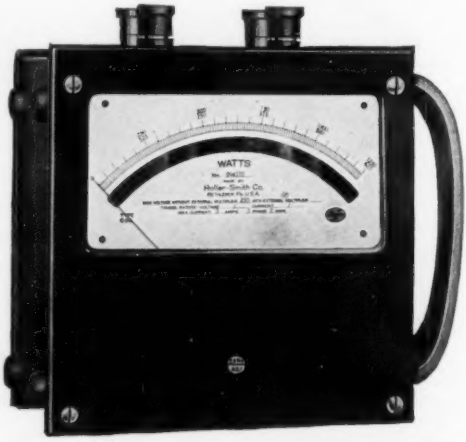
and cadmium electrode. A special scale is provided for measuring battery voltages up to 28 volts and also a special scale marking is provided for indicating the condition of the individual cells, making it possible to determine if the negative plates or positive plates are deteriorated without the necessity of removing the battery from the



Type DS-2 Portable d.c. Volt-Ammeter. (General Electric Co.)

used for jewels as it is the hardest and most practical substance obtainable for this purpose. One can appreciate the hardness by the fact that if a properly hardened and polished steel pivot is let fall a distance of a foot or two on the surface of a sapphire stone, its point would be blunted or burred, but if let fall on the surface of ordinary window glass, the pivot would not be damaged but would make an indentation in the glass. Therefore, one soon appreciates the importance of carefully handling any instrument. Likewise it is not good practice to ship portable instruments by freight. The shipping boxes should be marked "Fragile — Glass — Handle with Care." It is common practice to use knife edge pointers on most all portable instruments from the 2″ scale size up to the large laboratory size with scales 12″ to 14″ long. By means of a slot through the dial and a highly polished nickel plated mirror placed under the dial the image of the knife edge pointer can be observed and thus enable one to make accurate readings, removing the possibility of an error due to parallax. Considerable trouble may be experienced with paper dials warping and discoloring due to atmospheric conditions, but by the use of metal dials this trouble can be eliminated. They are much easier to keep clean. If a lithographed surface is properly applied, marking is as easy as on paper. Linear expansion, due to temperature, is much easier taken care of than with paper dials.

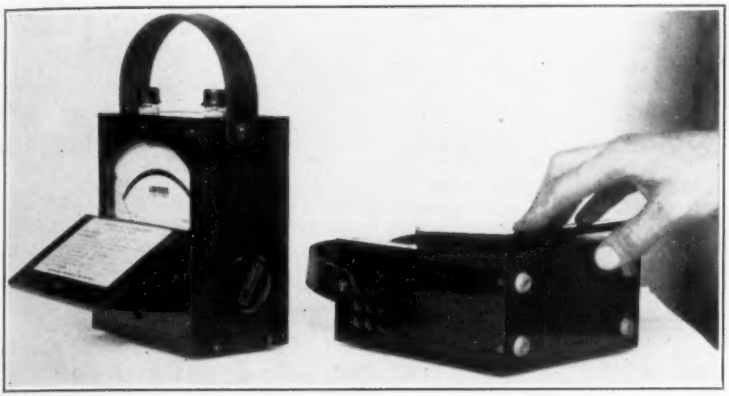
Pattern No. 171 a. c. Voltmeter (Jewell Electrical Instrument Co.)



Type GSA Wattmeter (Roller-Smith Company)

Frequently, dust and dirt get into instruments due to poor joints between case and cover plate, or due to the wooden cases warping or joints pulling apart. This has

been overcome by the use of cases made up of molded or insulating material. The surface is hard and withstands knocks that would ordinarily scratch a highly polished wood surface. The surface can be made to take on a high class appearance, and even have the appearance of the hard wood grain. The use of rubber feet help absorb shocks particularly on the large sizes, but the smaller sizes being lighter in weight can be subjected to rougher handling without impairing the accuracy to any great extent.



PY-5 Ammeter showing external view of series-parallel switch, and voltmeter with cover being pressed down to operate the lock-down push button.

——— :: ———

Every purchaser pays the cost of selling him the goods he buys. It is the seller's business to use every means to keep the selling cost low and make the service worth all that it costs.

——— :: ———

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"You, yourself, are an advertisement.

"I've seen hundreds of business failures turned into thundering successes when a believer in advertising took the helm of that sliding concern."—Chas. E. Carpenter.

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The Ostwald Color Theory

Albert Parsons Sachs *

(Continued from February Issue)

COLORS, as we have previously pointed out, consist of two classes, the *dull* and the *bright*. The dull colors are the grays, white (which is the lightest gray) and black (which is the darkest gray). The bright colors include yellow, red, blue, green and all the intermediate colors.

Gray is a mixture of black and white. A gray fabric can be produced by mingling black fibers with white fibers; sugar and soot intimately ground together give a gray mixture. The higher the proportion of black fibers or of soot, the darker is the gray produced.

We shall now indicate a method of naming and measuring grays accurately. We shall first locate the lightest and the darkest grays. If our method is based on sound, reasonable principles, our results will be accurate and beyond criticism.

Ordinary white light is very complex. We can separate it into its components by means of a prism or other instrument. A pure white surface is one which reflects all the light incident on it and at the same time scatters it irregularly. If it reflects all the light without scattering it we have a perfect mirror. The paper on which this is printed is a fairly good commercial white. It reflects a large percentage of all the light incident on it and absorbs only a small amount. The amount absorbed is of the same nature as that reflected, i.e. the absorption is not selective. If the sheet absorbed proportionately more of the blue it would appear yellowish.

It is desirable to obtain some easily prepared stable substance as our reproducible white standard. It has been found by careful measurement that chemically pure barium sulfate represents the best white obtainable at present. Its lightness (i.e. the percentage of incident white light reflected) is very high. If we call the lightness of this barium sulfate 100, the best zinc white has a lightness of 95, and chalk has a lightness of only 80 and furthermore is yellowish (not gray).

A pure black is one which reflects no light whatsoever. The very blackest satin reflects a little light and the blackest printing is only a moderately deep gray. A perfect black can be obtained by making a cubical box, several inches on each edge, of the blackest paper obtainable. The black surface must be the *inside* of the hollow cube if the paper is black on one side only. If now a hole is cut in the center of one of the faces of the cube, this hole will appear black, blacker than the blackest satin.

Having thus defined white and black, we can now define gray accurately. Every gray color is defined by the percentage of incident light which it reflects. Gray 25 reflects 25% of the incident light, gray 88

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reflects 88% of the incident light. The measurement of the value of a gray color is simply carried out with the aid of the half-shadow photometer in a dark-room. A daylight lamp is used as the source of light, and barium sulfate suitably prepared is used as the standard.

The half-shadow photometer or "Hasch" consists of a dark box divided into two parts by a partition along its length; on the floor of this box the two colors (the unknown and the standard) are placed. In the cover there is the double prism of a Wolf colorimeter (Figure 1) which brings the light reflected from the two samples into the field of vision as sharply defined contacting semi-circles (Figure 2). An adjustable lens placed at the upper face of the prism makes reading easier.

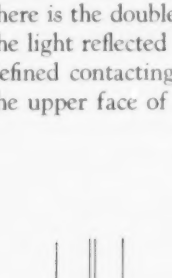


Fig. 1.

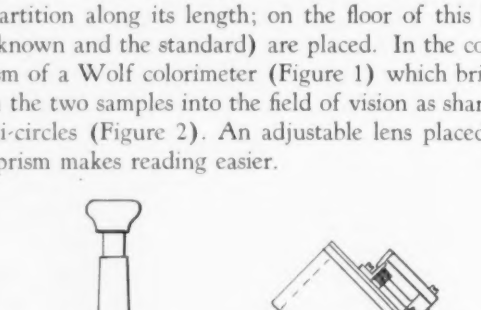


Fig. 3

Fig. 2

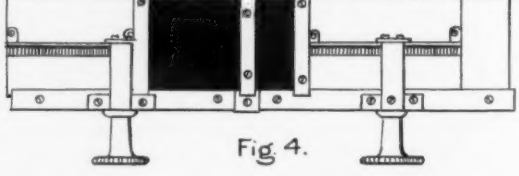


Fig. 4.

Both samples are illuminated through a bevelled slot calibrated along its length (Figure 3). It is adjusted in width by two movable diaphragms. It makes an angle of 45° with the perpendicular corresponding to the general proposition that the examination and measurement of all surfaces should be carried out perpendicularly to these surfaces with light incident at 45°.

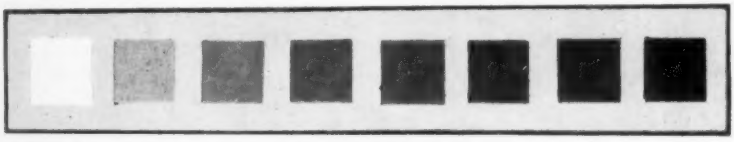
For the measurement of the light we have the two adjustable diaphragms which vary the width of the slot. They are 50 mm. wide and can be opened somewhat further than 50 mm. (Figure 4). The motion is best controlled by a tooth and wheel device as the adjustment is made

with greater certainty during rapid to and fro motion than by a slower screw motion. The incident light is scattered uniformly, most simply by paraffined paper. The amount of incident light is proportional to the area exposed by the slot which can be read off on the scale. The scale is divided into 100 half-millimeters, and a vernier permits readings to 0.001 of the full opening.

To make the first measurement, two cards coated with normal white are placed in the box, care being taken to have them coplanar by the use of a suitable holder sliding in a groove. The left slit is opened to 100.0, and the circular field of vision appears divided by a vertical diameter, exactly as in the case of a polariscope.

The right-handslit is then adjusted until both halves appear equally bright. If the apparatus and illumination are symmetrical the right-hand reading should be also 100.0. Ten readings are taken and averaged. The observer learns the limits of his own sensibility and a good average value is obtained. Suppose the average is 99.8. Then the right-hand slit is set at this value (corresponding to 100.0 in the left-hand slit), the unknown is placed on the right-hand side of the holder leaving the standard on the left-hand side. The left-hand slit is moved to and fro until the standard looks as dull or bright as the unknown. The average of ten readings is taken. After a littie practice five or even three readings are sufficient.

As standards alter owing to accumulation of dust, darkening by light, etc. it is desirable to protect these master standards and to use any convenient white paper as standard. This white paper is tested as above by placing it in the left-hand side. If, for instance, the right-hand slit is set at 91.2 for a left-hand setting of 100.0, then the white paper is used as standard in the left-hand side but the right-hand setting it left at 91.2 to give direct correct readings on the left-hand scale for any unknown.



a c e g i l n p

Fig. 5. The Gray Scale.

Although this method of measuring gray colors accurately is simple and rapid, nevertheless it is desirable to have standard scales for direct comparison. Scales of suitable size colored in tempera, dyes or by other desirable means, are prepared. These scales have a pure white, or the purest available white at one end, and a deep black at the other. Intermediate grays are prepared and the whole forms a ladder or scale. Ladder is the more appropriate name as these scales consist of a card-board frame with rungs of color. The spaces between the rungs are cut out altogether (in Figure 5 the narrow strips between the lettered rungs are cut out completely and the background shows through).

These grays for the gray ladder are not chosen arbitrarily. Their selection is one of the most important features of the Ostwald Color Theory.

Although the eye can distinguish about a hundred distinct grays between gray 100 (pure white) and gray 00 (pure black) its sensibility is not uniform over the whole scale. The eye cannot distinguish between gray 99 and gray 98, nor even between gray 99 and gray 95, but it distinguishes very easily between gray 4 and gray 5, and can distinguish several intermediate colors between gray 1 and gray 2.

This precludes any use of an arithmetically divided scale. Psychology has been able to give us the means for arriving at a suitably spaced scale. According to the Weber-Fechner law, two stimuli (i.e. gray colors) affecting a sense organ (i.e. the eye) must differ by at least a certain *fraction* before they can be distinguished as different.

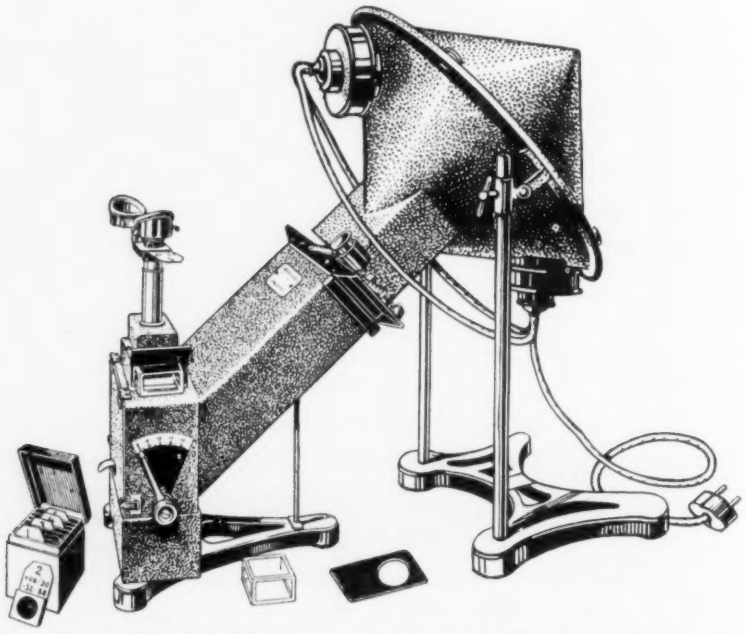


Fig. 6 Janke & Kunkel's Modification of the Ostwald Half-Shadow Photometer.

Our series of grays must, therefore, be so arranged that each member will contain a certain fraction of the white content of the preceding member. Such a series might be 100, 50, 25, 12½, 6¼, or 100, 75, 56, 42.2, 31.6, 23.7, etc. As a result of many considerations, psychological and practical, a scale has been selected with ten intervals between 100 and 10, and ten intervals between 10 and 1. This makes our series

100	79	63	50	40	32	25	20	16	12.5
10	7.9	6.3	5.0	4.0	3.2	2.5	2.0	1.6	1.26

Each member is approximately 20% less than the one preceding it. Be-

tween 100 and 79 we can find as many grays as we desire, but for practical purposes the mean values between two members have been chosen for the standards. The mean value of 100-79 is 89, 79-63 is 71, etc. Our standard gray scale is, therefore,

89	71	56	45	36	28	22	18	14	11
a	b	c	d	e	f	g	h	i	k
8.9	7.1	5.6	4.5	3.6	2.8	2.2	1.8	1.4	1.1
l	m	n	o	p	q	r	s	t	u

Under each number (which expresses the percentage of white light reflected by the gray of which it is the number) there is a letter which represents the gray. Thus *h* means 18% white and 82% black. It is found that *a* and *b* are much alike, *b* and *c* are much alike, etc.

There are more grays in this scale than are actually necessary for *practical* purposes. It is sufficient if we use every other member of the above full series to arrive at the practical series:

89	56	36	22	14	8.9	5.6	3.6	2.2	1.4
a	c	e	g	i	l	n	p	r	t

a looks white, *c* is a very light gray, *e* is a light gray, *g*, *i*, *l* are increasingly darker, *n* is almost black, *p* is the blackest shade which can be dyed on paper, and *r* and *t* are deep blacks producible on satin.

We have then 10 practical grays which represent the whole range of gray, and can be used as standards. Just as manufacturers have found it an intolerable burden to produce piping and valves of all the following sizes: 2, 2-1/16, 2⅛, 2-3/16, 2¼, 2-5/16, 2⅜, 2-7/16, 2½ inches, etc., and have limited themselves to a few standard sizes amongst these so that all reasonable needs can be met, so in all the technical applications of color, of all the millions of grays possible, it will suffice if we choose just these ten. They differ sufficiently so that they are readily distinguishable and yet similar enough so that all reasonable needs for variety can be met.

The full scale (*a*, *b*, *c*, etc.) is more than ample to meet all the requirements for various shades of gray. No shade of gray can possibly be produced which will differ by more than a very small amount from the grays in this scale. All the benefits which result from the use of standards will follow from the adoption of this scale as standard. Fewer standard colors, less matching, the simple formation of color harmonies (as will be shown later) will be some of the results.

Henceforth *i* means the same gray to every person in all the world; a cable from Paris may read "stockings gray g fashion next season" and manufacturers could dye their hose to shade without waiting for samples to arrive from Paris. We have learned to measure the gray or dull colors and the notation or language to describe them follows naturally.

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The Wilip-Galitzin Seismograph

Prof. J. W. Tynan, S. J.*

THE following is a description of the Galitzin seismograph developed by Prof. Joseph Wilip of the University of Tartu, Esthonia. To those familiar with the original type, it is sufficient to say in general, that there are three main points of difference. These are: first, the new instrument is more compact; second, it is hermetically sealed and third, instead of resting on three points, it is bolted to the pier at these points. The vertical component has the additional difference that it is supported by two helical springs instead of a single spring. The reader may find Prof. Wilip's own explanation of his reasons for the change in a pamphlet (in English) issued by the University of Tartu.

Let us proceed with the description, giving first the general characteristics, common to both the horizontal and vertical seismographs and then describe each type in detail. Both are mounted on a cast iron base 20″x15″ and about 2″ thick. The outer edge of this base contains three flanges, one at the center of one end and the others opposite each other on the sides. These flanges are bored for the pier bolts by which the instrument is fastened down. The periphery of the pier base is polished to take the instrument cover, which consists of a brass frame fitted with heavy plate glass. The cover is attached to the base by twelve screws. A layer of vaseline or some such material is introduced between the cover and the base to form an air-tight joint. The panes of plate glass are cemented in the frame by means of Rudol.

The recording system for both instruments is galvanometric. The galvanometer is a Deprez-D'Arsonval with bi-filar suspension. The recording drum is rim-driven by a hand-wound spring motor with conical pendulum regulator. Lateral motion of the drum is accomplished by having the extended drum shaft, which is cut by a worm thread, revolve in an edged roller.

We shall now consider the construction of the horizontal seismograph itself. The base plate, already mentioned, is surmounted by a frame which supports the pendulum. The pendulum suspension is an adaptation of the method employed by Galitzin, and is worthy of note. In Fig. 1, EE is the support proper and consists of a brass casting. It is connected to the frame at the top by means of adjustable screws, which allow fore and aft movement, for the purpose of inclining the axis of rotation of the pendulum and setting the natural period. The lower part of EE terminates in a device for the lateral displacement of the pendulum. The structure LL is the pendulum boom and is attached to EE by means of flat springs (FF) about .03 mm in thickness, in such a way that it tends to draw the upper spring forward and push the lower one back. In the figure, G is that so-called stationary mass, or pendulum

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bob and consists of cylindrical brass weights, about 4.5 Kg. mounted symmetrically to LL. The prolongation of LL beyond G serves as the mounting for the recording and damping devices. In the figure J represents the position of the recorder and consists of a flat celluloid case con-

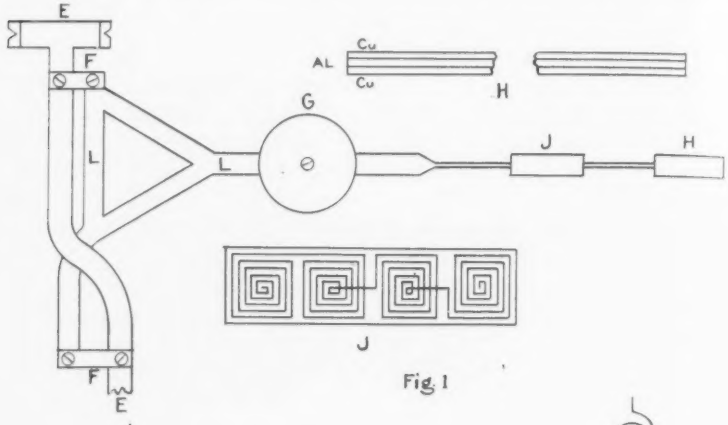

Fig. 1

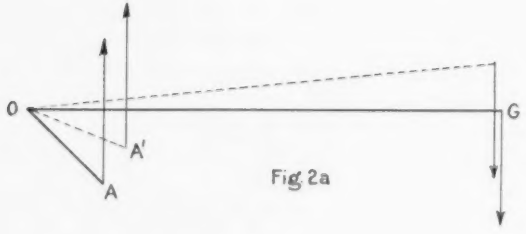

Fig. 2a

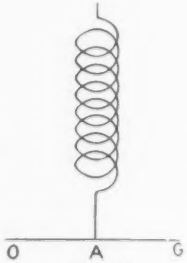

Fig. 2b

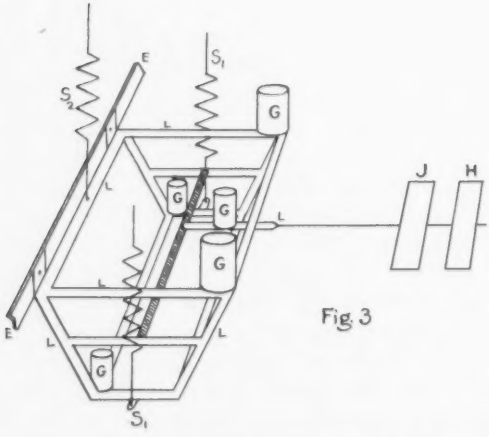

Fig. 3

taining four flat coils in series. These move between the poles of two strong permanent magnets. Leads from the coils are brought back along LL and to a point near the upper suspension spring, where very flexible

conductors effect the passage of the current without interfering with the motion of the pendulum. The leads are then brought down along the frame to the base, the outside edge of which contains the terminals for connection to the galvanometer. The outermost part of LL contains the damping vane, H, a flat composite strip of the same general dimensions as J, but made up of a "sandwich" of aluminum between strips of copper. This combination is due to Monsieur O. Somerville, who found that the diamagnetic qualities of the simple copper vane had the effect of changing the period of the pendulum. This vane moves between a pair of magnets, the same as those in the recording part. Both pairs of magnets are adjustable and permit increasing the strength of the gal-

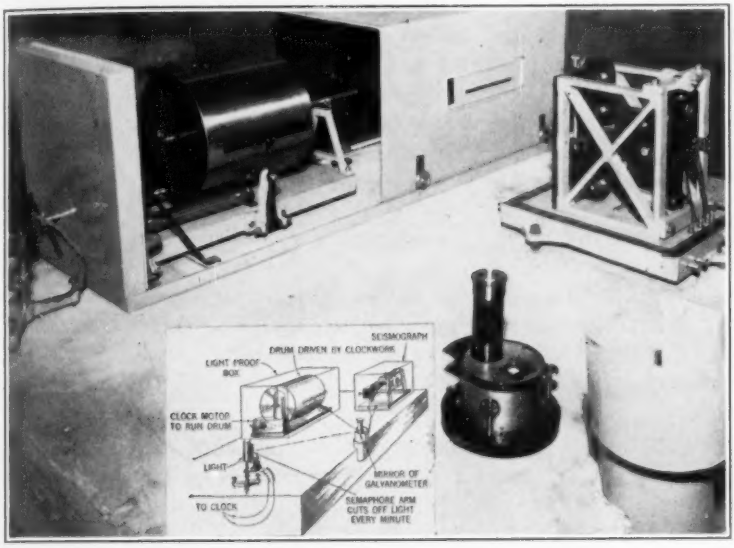

Fig. 4 The Galitzin Horizontal Seismograph developed by Prof. Joseph Wilip, University of Tartu, Esthonia, records photographically by means of a mirror galvanometer. (Insert illustrates operation of the Instrument.)

vanometer current and varying the damping up to a periodicity. This completes the essentials of horizontal instrument and omits only the accidental devices, such as the electromagnetic knocker which serves to give an impulse to the pendulum, a small plane mirror mounted on the rear of the moving element, which serves as the fulcrum of an optical lever by means of which the period of the instrument is obtained.

Coming now to the discussion of the vertical component, we might recall that efficient instruments for this motion are not at all common, on account of the great difficulty in obtaining a sufficiently long period. The problem will not be considered here. Suffice it to say that Ewing solved it in a simple manner. Galitzin adopted the solution and Wilip retained and improved it. Ewing's solution consisted merely in chang-

ing the point of application of the supporting spring A in Fig. 2a from a point on a line with O, the axis of rotation and G the center of gravity of the pendulum mass, to the position denoted by A in Fig. 2b. This had the effect in small displacements of equalizing the moments of the elastic pull of the spring, and the gravitational pull of the mass.

Let us resort to Fig. 3 to describe the Wilip-Galitzin type. Let EE again represent the supporting member which is fixed to the frame and LL the mobile member. LL consists of a brass casting and is hinged to EE by flat springs of the same size as those employed in the horizontal pendulum, but varying in thickness, being 0.07 mm thick. The weights, about 5 Kg. in all are symmetrically placed about the frame and fastened to it. The recording and damping members are the same as those employed in the horizontal, except that they are set upright instead of horizontal. The first set of supporting springs (S_1)are attached to LL, below, by means of small flat springs and terminate above in screw ends, which pass through holes in the frame above and are taken up by nuts which permit variation of the spring tension. The apparatus also contains a small spiral spring (S_2) connected above to the frame by an adjustable nut and below to the upper part of LL. It is this latter spring which makes the Wilip instrument a two spring-suspension. It is designed to keep the inherent period of the pendulum constant throughout the wanderings of the zero point. In previous designs it was noted that when the pendulum found a resting place lower than the horizontal, due to a change in temperature, the inherent period was increased and when the resting place was above the horizontal the opposite effect was produced on the pendulum.

Prof. Wilip's reasons for adopting the double spring system are very ably presented by him in an article (in German) in the Beitraege zur Geophysik, Vol. XIX, No. 4, 1928. Many observations have shown him that the defect of the older system had been removed and that the inherent period remained nearly constant, whatever the position of the pendulum with reference to the median point. He found that the best effect was produced by a proper selection of the points of application of the two spring systems. The first set of springs, as we have seen, was attached to the mobile member below the center of gravity of the pendulum and the second above.

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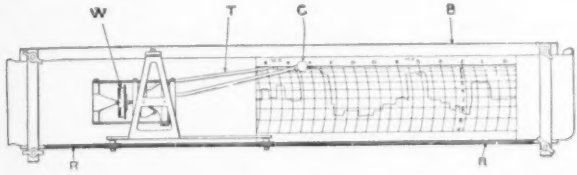
The Brown Instrument Company, Philadelphia, Pa., announces that Mr. O. B. Wilson, has been placed in charge of the company's Cleveland, O., office, 819 Hippodrome Building. Mr. Wilson has been with the Brown Instrument organization over 5 years and has had extensive experience in serving the needs of instrument users from the home office and in the New York sales territory. His many friends in the field will wish him much success in the Cleveland sector.

Integration of "Orifice Head" Charts by Means of Special Planimeters

John L. Hodgson, M. Inst. Mech. E.

IN an article which appeared in the November number of INSTRUMENTS, I gave a rule which enabled "Orifice Head" charts to be integrated by means of ordinary "area measuring" or "radial" planimeters to within known limits of error. This rule was especially applicable to charts which recorded fairly steady flow values.

In the following short note I propose to describe two special planimeters which enable the flow to be obtained with accuracy from "orifice head" charts in those cases where the orifice head recorded has fluctuated quite considerably.



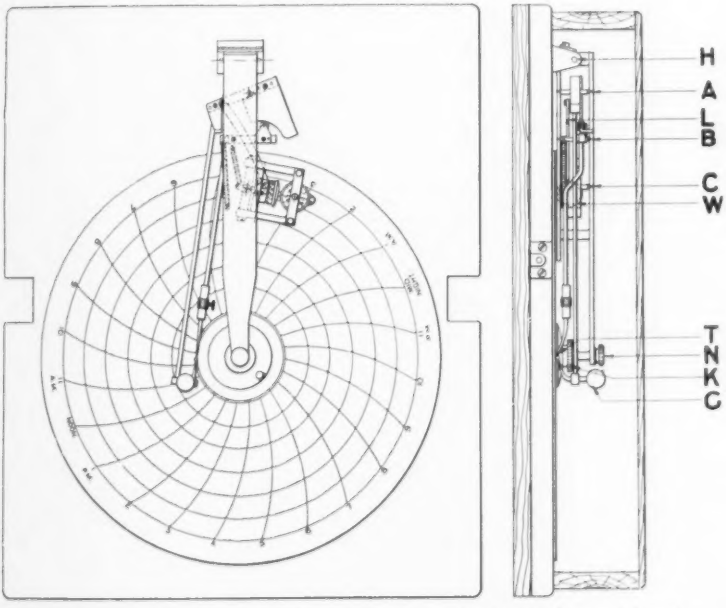


Fig. 1—Special Planimeter for integrating cylindrical charts (above).
Fig. 2—Special Planimeter for integrating circular charts (below).

These special planimeters adapted for use with cylindrical or circular charts are illustrated in Figs. 1 and 2 respectively.

In both of these instruments a guiding pointer G actuates a tracing pointer T through a cam and roller mechanism which is so arranged that if the tip of the tracing pointer follows the line of the diagram, the plane of the planimeter wheel W, whose axis is carried on a weighted frame which moves with the guiding pointer, is given such an inclination to the line of its relative motion across the diagram that the correct amount is added on to its reading for each position that the tip of the tracing pointer may take up.

In the planimeter shown in Fig. 1, the diagram to be integrated is covered by a piece of tightly stretched tracing cloth on which the planimeter wheel, pressed down by its weighted frame, rotates as the traversing carriage is pulled along the guide rail R.

In the planimeter shown in Fig. 2, the diagram to be integrated is clamped to a freely moving central spindle and rotated by one hand, while the guiding pointer G is moved by the other. In order that the circular diagram can be slipped into position and clamped by the nut K, the frame carrying the pivots A, B and C of the guiding pointer, tracing pointer and planimeter wheel frame respectively can be rotated back about the hinge H, when the nut N is unclamped. It will be noticed that in this second instrument the guiding pointer G is not attached to the bar at the ends of which the weighted planimeter wheel frame is pivoted, but is connected to it by means of a link L.

At the end of a traverse with either of these planimeters, the increase in the planimeter wheel reading shows the mean height of the diagram expressed as a decimal of the maximum height. It is, therefore, only necessary to multiply this increase of reading by the rate of flow corresponding to the maximum height on the diagram in order to obtain the mean rate of flow required. The mean rate of flow multiplied by the time interval for which the planimeter has been traversed gives the total quantity of fluid passed.

It will be seen that these planimeters enable fluctuating diagrams to be readily integrated, and that they do not require the pen motion to be exactly proportional to the orifice head; as any standard deviation can be allowed for when filing up the cam.

They are eminently suited for those cases where one user has many similar meters, but they are expensive to purchase when only one meter is used.

The theory of these two planimeters is given below:

In the case of the cylindrical chart planimeter shown in Fig. 1:

$$\text{Turns of planimeter wheel W for traverse of length } l = \frac{l \sin \theta}{2 \pi r} \quad \ldots\ldots (1)$$

where r = radius of the wheel W,

and θ = angle between plane of wheel and direction of motion.

In the case of the circular chart planimeter shown in Fig. 2:

$$\text{Turns of wheel W for one rotation of the circular chart} = \frac{(d_o + c\theta)\ \text{Sin}\ \theta}{r} \quad \ldots\ldots\ldots(2)$$

where d_o is the distance between the centre of the planimeter wheel and the centre of the chart when $\theta = \theta$,
and c is the distance between the centre of the planimeter wheel and the pivot C, shown in Fig. 2.

In deriving Formula 2, it has been assumed that the angle moved through by the frame carrying the planimeter wheel is equal to θ, and that the increase in the distance between the centre of the planimeter wheel and the centre of the chart for an angular movement of the frame of θ is $c\theta$.

Neither of these assumptions is quite correct.

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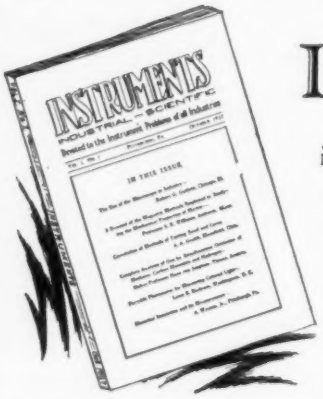
and θ = angle between plane of wheel and direction of motion.



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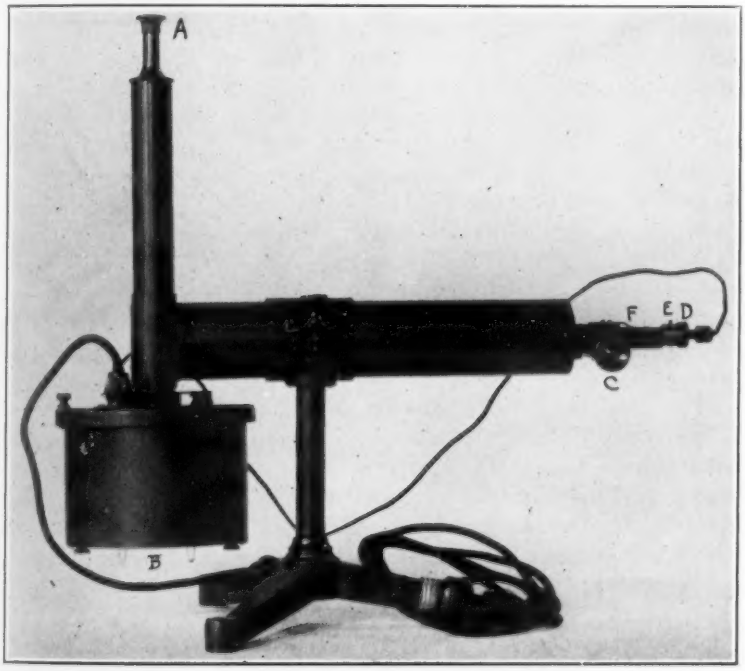
The Nigrometer

C. R. Johnson

Purpose. This instrument has been developed to provide a measurement of blackness. It is designed to cover the range of black effects produced by black pigments embracing carbon blacks and lamp blacks, when these pigments are examined dry or in oil, paint vehicles or printing ink vehicles. It can also be used to determine the blackness of finished products i.e. printed, varnished and painted surfaces.

While the scale of the instrument is purely arbitrary, it does give a quantitative value which is an advantage over the usual method of making comparisons with the eye.



Principle of Nigrometer. The instrument is a photometer or intensimeter, designed to provide great intensity of illumination on the black

*Technical Director, Godfrey L. Cabot.

surface to be measured and provided with a movable light source within the horizontal tube and attached to the movable scale. By varying the position of this movable light source, a photometric balance is obtained. This point of photometric balance is taken as the measure of the blackness of the sample under examination.

Operation. The instrument is first connected to a 110-115 volt electric circuit. The black sample to be examined is placed in position so as to cover the central opening at point (B) in the bottom of large cylindrical member containing the six lamps. The lamps are lighted by means of the button control switch. The observer looking through eye piece (A) will see a small elliptical field in the center of the larger circular field. This elliptical field may appear darker or lighter than the circular field. The operator then turns the milled knob, (C) until the elliptical field disappears. This point is taken for the reading of the index pointer (F) on the graduated scale and this reading is the blackness value. In practice it is easier for some operators to reach a balance by running back and forth over the point of disappearance several times from each side of approach. After each reading the button switch controlling the lamps of the instrument should be shut off to avoid excessive heating.

Since the instrument operates on an arbitrary scale and because it is impossible to secure lamps which do not change in characteristics during life, a standard of blackness is furnished. This is in the form of a small black tile mounted in a box. Great care should be taken to protect the surface of the standard tile from scratches. The correct reading for the standard tile is marked in its container. Upon receipt, the instrument should be checked against its standard tile. From time to time during use, the instrument should be checked against the standard. If at any time the reading of the instrument does not agree with the value given for the tile, adjustment can be made by first setting the instrument at the correct reading for the tile, next place the tile in position for reading, then loosen set screw (E) and turn the milled nut (D) in the proper direction to make the elliptical field disappear. The set screw (E) should always be tightened after each adjustment.

Removable clamps are provided which are attached to the bottom of the large cylindrical member by thumb screws. These clamps can be used to hold in position the standard tile or a glass slide two inches wide. Such a slide is a convenient means for testing paints, varnishes, or blacks mixed in oil. The smear of black material on the slide should be large enough to cover completely the central opening when the slide is in position for reading.

Type EAF Circuit Breaker

80 Amperes and Less, 250 Volts and Less D.C., 550 Volts and Less A.C. Two and Three Pole

(Roller Smith Company)

General Description. The Type EAF breaker is designed primarily for industrial work, such as the protection of motor and lighting circuits. To comply with the requirements of the industrial field such a breaker must be enclosed, rugged in construction, compact in size and moderately priced. It must provide time limit and non-closable on overload protection. The Type EAF embodies *all* of these features.

Installation. The breaker is enclosed in a two-piece steel case so designed that the cover may be completely removed from the bottom by simply taking off two wing nuts. The lower section of the case is equipped with three knock-outs on both the top and bottom and two knock-outs on each side. This liberal allotment of knock-outs will accommodate prac-

tically any arrangement of wiring or conduits. The breaker may be mounted on a wall, post or supporting frame by means of four ¼" screws. The breaker proper is mounted on a slate panel and this panel may be removed from the case by taking out four corner screws, so that if the installer prefers having the breaker out of the case during the process of pulling in the leads, soldering on cable lugs, etc., this can be done without any complications. The fact that the breaker proper can be

removed from the case by the removal of four screws is an advantage, also, in that at any future time breakers of different capacity can be interchanged without disturbing the wiring or conduit leading to the breaker box.

Method of Operation. The breaker is closed by pressing down an insulated handle, which projects from the right hand side of the case Knocking the handle upwards opens the breaker. There are no other operating knobs or devices to be manipulated. A target indicates the "Open" or "Closed" position.

Barriers. All breakers are equipped with a barrier unit separating the arcing members from each other. This unit may be removed without tools by simply lifting up on the sides of the structure, disengaging two spring hooks. In this manner it is possible to instantly inspect the contact members and carbons.

Non-Closable on Overload. First of all, the Type EAF breaker is essentially a non-closable on overload type of breaker. In other words the breaker cannot be held closed against an overload.

Overload Protection. The breaker is built in either two or three pole combinations. The overload coils are standard equipment in either case. The two and three pole breakers are exactly the same size, the only difference being that the centre pole is omitted in the case of a two pole combination. The overload trip consists of extremely efficient electromagnets, whose armatures may be set at the different points of calibration by means of two set screws. Breakers are calibrated from the normal rating point to a point 100% in excess of normal. The overload coil units are such that they may be replaced in the field, either with others of the same size, or ones of a different capacity. For example: A breaker originally shipped from the factory as a 10 ampere one can be changed later to a 30 ampere size by the simple substitution of 30 ampere units, this being accomplished by removing four screws and four nuts.

Time Limit Protection. Time limit protection is afforded by means of extremely simple and efficient dashpots, whose outstanding characteristics are quickness in resetting and freedom from oil overflow. But a few drops of oil are sufficient to fill the oil chamber. Extra oil can be added by means of a small oil can, which accompanies each breaker.

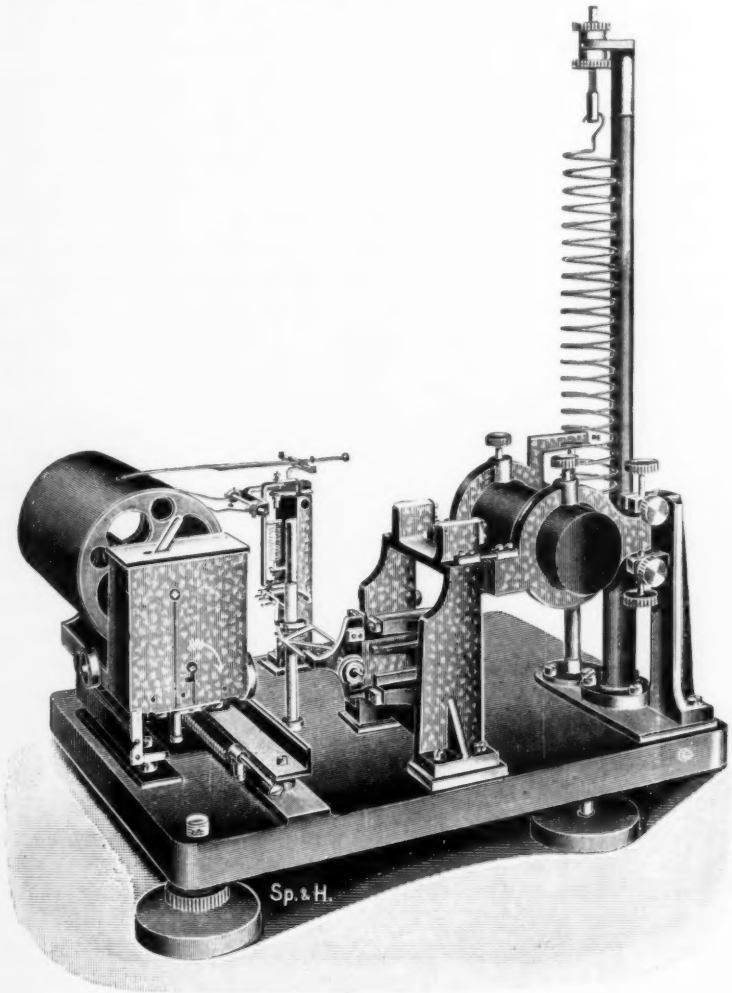
Under-Voltage Protection. Either one or two under-voltage attachments can be placed on any Type EAF breaker without modifying the original structure. The under-voltage attachments are held in place by means of two screws accessible from the front. On standard three pole breakers one under-voltage unit is supplied, unless otherwise stated.

Shunt Trip. If it is desired to open a Type EAF breaker from a distance by means of a shunt coil, this can be accomplished by having the specifications call for a shunt trip feature. This device can be added without modifying the original equipment.

Recording Vibration Meter

(*O. C. Rudolph*)

THE vibration meter, in form of a vertical seismograph, can be used for recording vibratory motions or components of vertical movements in the ground, such as are caused by heavy motor trucks, railroad trains, rotating machine parts, blasting, etc.



The construction is similar to that of the Wiechert "Vertical Seismograph." The principle is very simple. The movements of the ground are transmitted to the fixed frame of the instrument and then displaced rela-

tive to an inert mass, which on one side is movable about a cross spring joint and on the other side is suspended by a vertical spiral spring. The relative vertical movements of the mass are enlarged by a lever transmission and transformed into the horizontal movements of a pen, which in turn registers on smoked paper. The damping of the movements is caused by paraffin oil. The damping device is adjustable and can be regulated in such manner that a damping proportion between 6:1 and 4:1 is obtained. The damping is an absolute necessity as otherwise the apparatus would register a resonance curve of the same amplitude as the apparatus, although at changing frequencies of the exciting oscillations. In this case the amplitudes of the ground movement according to the frequency of the exciting oscillation would be obtained enlarged in different proportions; such diagrams cannot be calculated. However, if the above damping device is used and further care is taken that the frenquency of the apparatus is below the exciting frequency, then the ground movement is recorded in the same proportion also for different frequencies.

In case of vibrations caused by traffic the periods are about 1/10 -1/100 of a second; the period of vibration of the instrument itself is about 1/2 second and therefore meets the requirements.

The weight of the swinging mass is 12 kg., the enlargement according to adjustment about 30, 60 or 100 times. The registering drum is driven by a clockwork which insures a uniform speed. By the use of air fans of different size, the registering speed can be adjusted according to requirements from about 20-50cm per minute. The speed must be sufficient to obtain clear definition of the curves. After each full revolution, the drum is automatically displaced 3mm to one side.

After setting up the instrument ready for making measurements, the constants of the instrument must first be ascertained. Each instrument is supplied with instructions for use and for calculation of the ground movements. These instructions also contain information for ascertaining the constants of the instrument. The ground movements are registered in a seismogram. The recorded amplitudes are measured, and the real amplitudes are obtained by division through the constancy value. This value is usually not of interest. Of importance, is the maximum acceleration of the ground vibration, in order to arrive at the effect. To ascertain the acceleration, the ground vibrations must be regarded as sine like oscillations. If A is the real amplitude and T the period of the oscillation, then the maximum acceleration of a sine like oscillation is

$$b_{max} = \frac{4\pi^2 A}{T^2}$$

A has already been calculated, therefore, only the period T must be taken from the seismogram. The registering speed can be ascertained with a stop watch and the period T by comparison of the measured wave length with the registering speed. The maximum acceleration b_{max} can then be calculated.

New Indicator for Combustible Gases

THE Union Carbide Sales Company will presently place on the market a portable instrument that detects immediately the presence of a wide range of combustible gases or vapors and indicates whether or not the atmosphere containing these gases is safe to breathe and safe for flames or fire. This device was first developed by the Union Carbide and Carbon Research Laboratories, Inc., as a methane indicating detector for the detection of methane, or firedamp, in coal mines. The Methane Indicating Detector has successfully passed the rigid tests of the United States Bureau of Mines, and has received its approval as permissable equipment for use in methane and air mixtures. The Union Carbide Company Combustile Gas Indicator is identical in construction except for certain modifications to make the instrument better adapted to the detection of numerous combustile gases encountered in many industrial fields.

This Indicator utilizes the effect of combustion of flammable gas and air mixtures on the surface of a heated filament. This combustion increases the temperature, and consequently the electrical resistance, of the filament. This change in resistance causes the needle of a meter to move over a scale, from which the desired information relative to gas conditions is obtained. It comprises the following parts:

Detector Head or Combustion Chamber
Meter Case
Portable Storage Battery

The detector head consists of a cylindrical metal case or bonnet which screws onto a metal base equipped with a short carrying handle. The bonnet is provided with small openings which permits the atmosphere being tested to circulate about the heated filament. Within the bonnet are three concentric gauze screens, of a type similar to those used in flame safety lamps, which prevent the ignition of an external gas and air mixture. In the center of the chamber formed by these screens is the filament cartridge. The detector head is so constructed that accidental incorrect assembly of safety screens and filament cartridge renders the circuit inoperative.

A flexible twin conductor cable about fifty feet long connects the detector head with the meter case. The meter case contains the variable resistance in the detector circuit, the indicating meter, the control switch and a rheostat. A short flexible cable connects the meter case to the portable storage battery which supplies the power to operate the indicator.

The storage battery is carried on a leather belt worn around the waist. To this belt are hooked the detector head and the coiled cable. The meter case is carried by a light strap around the operator's neck, or it may be hooked onto the leather battery belt if so desired. The entire outfit is

compactly stowed in a carrying case from which it may be operated without removing the meter and battery from the case if preferred.

The indicator is made ready for operation by throwing the control switch first to the "Filament" position, then a few seconds later to the "Meter" position. Zero adjustment in fresh air is next made by turning the rheostat knob. The operator then places the detector head in the atmosphere to be tested and reads the meter. The detector head may be held in the hand, raised vertically or extended horizontally on a pole, or lowered by the cable into a manhole, tank, or elsewhere.

The U.C.C. Combustible Gas Indicator scale is of a type that will make the instrument equally useful to the average workman or the industrial chemist and safety engineer.

For the operator who desires to know the amount in per cent of a known combustible gas present in a mixture of that gas and air, the meter scale reading is taken and then referred to the particular curve or chart prepared for that gas. From the curve chart the operator reads directly the per cent of gas present corresponding to the scale reading of the meter. The gas charts are plotted with meter scale reading as the horizontal axis and the per cent of gas as the vertical axis.

If an unknown mixture of flammable gases exists, and the operator desires to know whether or not the mixture is explosive, the meter scale reading is taken and referred to a "Per Cent of Explosibility" curve.

Especially for those concerned with gas testing in and about oil tankers, oil and gasoline storage tanks, tank cars, oil refineries, and the like, the scale is also divided into a white section and a red section. If the meter needle comes to rest anywhere in the red section an atmosphere containing 0.2 per cent or more of combustible gas (expressed as pentane vapor) is indicated showing that the atmosphere is unsafe to breathe without gas masks and unsafe for any work that requires heat or fire, or is liable to emit sparks. If the meter needle comes to rest in the white section, less than the equivalent of 0.2 per cent of pentane is present, and hot repair work may be done, provided that all other regulations and precautionary measures have been followed.

Some of the important features of the U.C.C. Combustible Gas Indicator are as follows: Sampling and laboratory analysis are eliminated, indications are immediate, explosive mixtures of gas and air are vividly indicated by continual oscillation of the meter needle, guesswork is eliminated as readings are direct and accurate, continuous observations may be made while men are working in gaseous atmospheres, all accessible parts of tanks or compartments can be thoroughly tested for gas pockets, the detector head may be lowered into a tank while the operator remains outside, the entire outfit is safe to operate in all gas-air mixtures except those containing acetylene or hydrogen, the apparatus is entirely self-contained and not dependent on any non-portable source of power, and since the platinum filament does not operate catalytically it is not subject to the deleterious effects of sulphur compounds.

Glass Strain Tester

(Askania Werke, A. G.)

THE importance of testing for freedom of strain in all glass articles, which are used in science and practice, has been known for some time. From the endeavor, to prevent loss of material and time, the necessity arose for a suitable and convenient means of investigation during the process of manufacture as well as before their use and from this grew the demand for glass strain testers.

Fig. 1 Askania—Glass Strain Tester for inspecting glass objects having a diameter of 6".

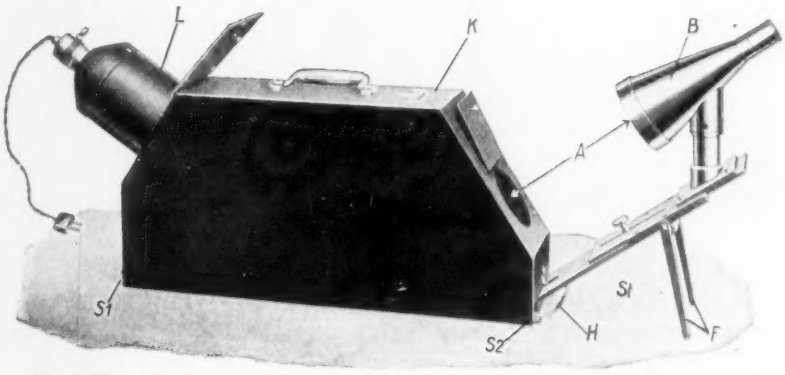


Fig. 2 Portable Askania Glass Strain Tester, can be used for objects up to 8" in diameter.

The Askania Glass Strain Testers serve for the investigation of glass pieces of all kinds (glass rods, tubes, bottles, tumblers, lenses, etc.). They furthermore permit testing different glass melts for checking of the expansion coefficient.

The operation of this instrument is so simple, that even an untrained workman can immediately use the instrument. The pieces to be tested

are simply held in the apparatus from either side. The change in color of the field of view by the piece is a measure of the degree of strain. An estimation of the degree of strain by comparison of the color of the strained glass body with the color steps of a gypsum wedge is also simple and can be quickly carried out. The comparison wedge is fastened to the Strain Tester so that it appears in the field of view at the same time with the piece to be investigated. The brightness of the field of view is so high, that filled and empty, colorless and colored glass objects can be investigated with ease.

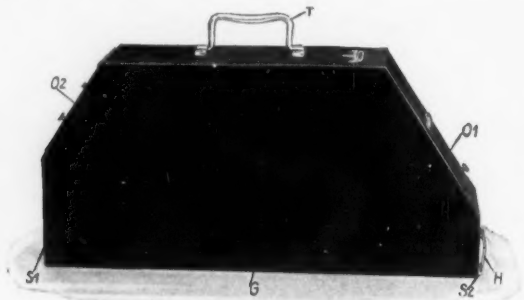


Fig. 3 Portable tester closed for carrying.

The use of a conveyor makes the investigation of the whole manufacturing process easier. The inspection of hot glass objects presents no difficulties.

The manufacturer by means of the strain tester, can control his whole production in all its individual operations and thereby prevents the production of waste.

The user protects himself, by using the strain tester, against the purchase of poor glass, therefore against useless expense.

The size of instrument is determined by size of the glass objects to be inspected.

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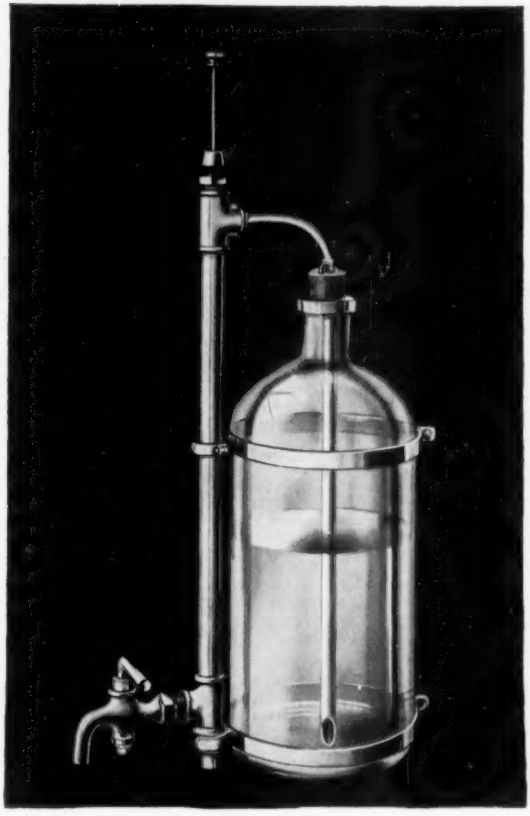
New Syphon Pump

(*Teschner-Meyers Co., Inc.*)

THE illustration shows a one gallon bottle equipped with this new syphon pump. The pump can also be supplied to fit any size bottle, carboys or even barrels.

This syphon pump is made both of Monel nickel polished outside and of brass, tinned inside and finished nickel on the outside. It eliminates entirely the inconvenience as well as the personal danger often involved in the use of the ordinary type.

For use on bottles it consists of two supporting rings, syphon pump and draft cock.



Information in Instruments

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PHOTOMICROGRAPHS OF IRON AND STEEL. *Everett L. Reed, S.B.*, Instructor in Metallurgy at Harvard University, with a foreword by Dr. Albert Sauveur, Gordon McKay Professor of Metallurgy and Metallography at Harvard University. John Wiley and Sons, 1929. Cloth 6x8, 253 pages, 218 figs. Price $4.00.

REVIEWED BY JOHN D. GAT

The appearance in metallurgical literature of the book, or rather album, of Mr. Reed is more than an addition of another interesting work, it is symptomatic of the situation developing in the metallurgical world similar to that existing in chemistry when investigators tried to get away from terms "slightly acid," "decidedly alkaline," etc., substituting them with a definite value of hydrogen ion concentration. The need for an authoritative metallographic ABC permitting independent workers to speak the same language has been long felt as can be seen from the favorable reception given to the Microstructure Chart of SAE Steels by Dr. Sauveur and the author of this book.

The photographs which are the real substance of this work are well made. Polishing is good with a few slight exceptions as well as lighting which could be improved only in a very few instances. It is difficult to say whether the tendency for stepping down too much at moderate magnifications reflects the individual preference of the author or is due to the peculiarities of optical equipment used. There seems to be no necessity for over-etching some of the specimens to show their structure clearly.

The presentation of the subject would gain if instead of illustrating a treatment with several steels of casual composition a few of them are selected and subjected to different treatments as it is done with 0.50 carbon steel. A little more definite captions would help to prevent misunderstanding when, as for example on Fig. 6, several inclusions are shown and only one mentioned.

On the whole the book is well printed with only a few mistakes in proof reading, gives much interesting information, including the description of up-to-date practice and while not bringing anything new to a metallurgist with a broad experience, it can be of great value to one less familiar with the subject or only occasionally coming in contact with some of the subjects treated in it.

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Bulletin 967 published by the C. J. Tagliabue Mfg. Co., 18 Thirty-third Street, Brooklyn, N. Y., covers the Tag Automatic Cycle Controllers for Tire Presses. The instrument is briefly described and it is pointed out that these controllers are not limited to tire presses but to a number of operations.

A. B. C. of Hydrogen Ion Control

A new edition of this book, published by the La Motte Chemical Products Company, McCormick Bldg., Baltimore, Md., has just appeared.

Bakelite Laminated

A recent direct mailing entitled "Reflecting the Many new uses of Bakelite Laminated" published by Bakelite Corporation, 247 Park Ave., New York, N. Y., illustrates some of the instances where Bakelite has replaced other materials.

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Circ. 106—P. 50-129 issued by the Leeds & Northrup Company, 4901 Stenton Ave., Philadelphia, Pa., illustrates a new long-barrel pen.

Continuous Electric Furnace for Heat Treating Strip Metal and Wire

Bulletin No. 140 issued by H. O. Swoboda, Inc., Pittsburgh, Pa., describes a furnace developed by this company.

Co_2 and Draft Recorder

Catalog RA29 covers the Hays Co_2 and draft recorder. This catalog is issued by The Hays Corporation, Michigan City, Ind.

Chemist Analyst

The January 1st issue of the Chemist Analyst, issued by the J. T. Baker Chemical Co., Phillipsburg, N. J., contains articles covering the chemical analysis of various materials.

Control Pyrometer

The Republic Flow Meters Company, 2240 Diversey Parkway, Chicago, Ill., has just issued Catalog No. 200 covering the construction, principle of operation and application of Republic control pyrometers.

Covers Industry like a Blanket

is the title of a bulletin issued by P. H. & F. M. Roots Company, Connersville, Ind., manufacturers of positive displacement meters.

Design and Control of Concrete Mixtures

is the title of a booklet published by the Portland Cement Association, Chicago, Ill. Testing of the concrete mixtures is taken up in this booklet.

Electrometer

Druckschrift No. 44 issued by Dr. Carl Leiss, Berlin-Steglitz, Germany, covers a new highly sensitive electrometer. This literature is printed in German.

Experimenter

The February issue of the General Radio Experimenter, published by the General Radio Company, Cambridge, Mass., has the following interesting articles: A New Relay; Three-Decade Voltage Divider; Coils for Magnetostriction Oscillators; Measurement of Direct Capacity.

Electrical Testing

The Wagner Electric Corporation, St. Louis, Mo., have issued Bulletin 138, the fourth edition of the Wagner Manual of Electrical Testing. This 20 page booklet covers the testing of single phase and polyphase transformers.

Flue Gas Analyzers and Portable Combustion Test Sets

is the title of a bulletin issued by The Hays Corporation, Michigan City, Ind. The instrument is very thoroughly described.

Gas Service Journal

The January issue of the Gas Service Journal, published by the Pittsburgh Equitable Meter Company, 400 Lexington Ave., Pittsburgh, Pa., contains the following: History and Development of the Gas Industry and Atlantic City's Problem; Another Gas Fired Heating Plant; Sales of Manufactured Gas in 1928 Sets New High Record; Some Early Dry Gas Meters.

Ground-Ohmer

A recent direct mailing of Herman H. Sticht Co., 21 Park Row, New York, N. Y., discusses ground resistance measurements.

Gas Leak Indicator

Bulletin No. 200 issued by the Colonial Supply Company, 217 Water Street, Pittsburgh, Pa., describes the "Cajo" Gas Leak Detector.

Instrument Investment News

The February issue of the Instrument Investment News published by the Consolidated Ashcroft Hancock Company, Inc., 100 East 42 Street, New York, N. Y., contains the following articles: Treating Disease with Industrial Instruments; It Takes all the Running You can do to keep in the Same Place; Meat Packers must know Temperatures; Temperature Control Highly Effective in Continuous Operations.

K & S Pocket Radiation Pyrometer

Bulletin No. 101 issued by the Colonial Supply Company, 217 Water Street, Pittsburgh, Pa., describes this radiation pyrometer. This bulletin is a revision of Bulletin No. 100.

K & E Engineers Transits & Levels

A leaflet issued by Keuffel & Esser Co., Hoboken, N. J., briefly covers their transit and level.

Model "DM" Megohmer

A recent direct mailing of Herman H. Sticht, 21 Park Row, New York, N. Y., considers the advantages of this instrument in comparison with a magneto for the determination of defects in electrical apparatus.

Master Instruments

The Jewell Electrical Instrument Company, 1650 Walnut Street, Chicago, Ill., have issued two bulletins entitled "Jewell Master Instruments" describing a complete line of intermediate size portable instruments of uniform dimensions especially suited for field service.

Ohmer

Special Leaflet No. 517 issued by Herman H. Sticht, 21 Park Row, New York, N. Y., is a new price list on the Standco Portable Ohmer, effective Feb. 1, 1929.

Phase Sequence Indicator

Price Sheet No. 514 issued by Herman H. Sticht, 21 Park Row, New York, N. Y., illustrates the Standco Phase Sequence Indicator.

Radio Instruments

Form No. 2004 published by the Jewell Electrical Instrument Company, 1650 Walnut St., Chicago, Ill., gives prices of Jewell Radio Instruments.

Student Microscope

A new student microscope is briefly described in a leaflet issued by J. Rosenbaum, Berlin S. O. 16, Germany. This is printed in German.

Systematic Checking of Insulation Resistance on Industrial Motors

is the title of a reprint from Industrial Power distributed by Herman H. Sticht, 21 Park Row, New York, N. Y.

Sperryscope

Vol. 5, No. 10 of the Sperryscope, published by the Sperry Gyroscope Co., Inc., Manhattan Bridge Plaza, Brooklyn, N. Y., contains the following interesting articles: Dramatizing the Gyro-Pilot; Looking through Steel; Sperry Searchlight Plays Active Part in National Election; Lansing Airport Uses Sperry Lights; Sperry Company Celebrates Navy Day of its Own; Gyro Compass Aids Dredging Operation; Mr. Sperry formally inaugurated as President of the American Society of Mechanical Engineers; S. S. "Munargo" completes Her Sixth year with the Gyro Pilot; etc.

Wheatstone Bridge for Meter Laboratories

Circ. 717a-G 30-1228 illustrates L. & N. Transformer Testing Sets. This circular is issued by the Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

Temperature Recorders for Steam and Feed Water

Circ. 8730-G 45-728 illustrates feed water and steam temperature indicators and recorders. This circular can be obtained from Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

Water Works Journal

The January issue of the Water Works Journal published by the Pittsburgh Equitable Meter Co., 400 Lexington Ave., Pittsburgh, Pa., contains the following: Water Supply of Kansas City, Mo.; American Water Meter Institute; Meter Records reveal Saving of Water in Altoona, Pa.; New Power Development One of Largest in the Country, Ample Reservoir of Water Created.

Wheatstone Bridges

Circ. 5401b-G 60-1228 issued by the Leeds & Northrup Company, 4901 Stenton Ave., Philadelphia, Pa., covers the Type "T" Testing Set for Linemen.

Universal Dial Indicator Set

Brown & Sharpe, Providence, R. I., have issued a leaflet to cover their No. 740 Universal Dial Indicator Set.

Water Testing Equipment

The National Aluminate Corp., 6216 West 66 Place, Chicago, Ill., have issued a bulletin describing water testing equipment for laboratory and power plant use, directions for use are also included.

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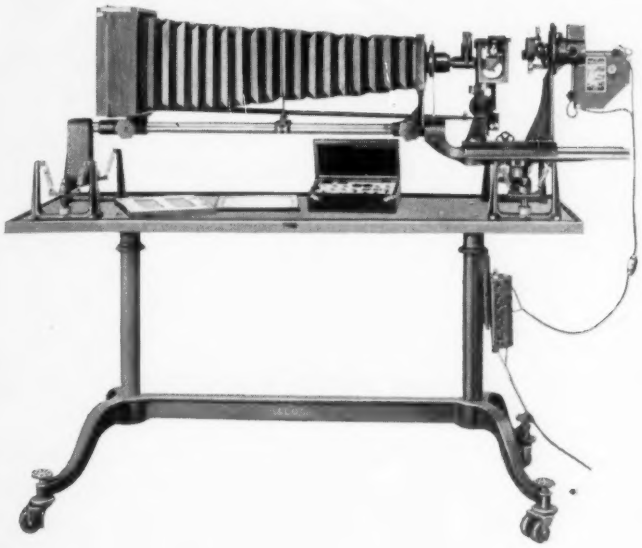

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Abstracts on instruments and devices for measurement, inspection and control

The Technology Department, Carnegie Library, Pittsburgh, Pa., will furnish photostats of material abstracted here. Negative prints are 35 cents per page, plus 10 cents for mailing (first class). All orders should be paid in advance. The library is not responsible for loss in mails.

Tripod and Pillar Microscopes. W. van Seters, Jl. Royal Microscopical Society, Dec. 1928, pp. 385-388.

Historical information as to the first of these types.—M.B.R.

The Difference Between the Mechanical and Optical Lengths of a Steel End-Gauge. F. Holt and H. Barrel, Jl. Royal Microscopical Society, Jan. 1, 1929, pp. 122-133.

Mathematical discussion.

Watthour Meters (Elektrizitaetszaehler und Tarif-Messeinrichtungen). F. Ferrari, Zs. V. d. I., Jan. 5, 1929, pp. 17-25.

This article considers the basic construction and means of operation of the standard meter. The advancements during the last year are given.

The Determination of Disruptive Strength of Solid Materials in Homogenous Fields (Die Bestimmung der Durchschlagfestigkeit von festen Stoffen im homogenen Felde). E. Marx, E. T. Z., Jan. 10, 1929, pp. 41-45.

The article considers instruments developed by Siemens & Halske.

The Determination of Silicon in Ferro-Silicon and other Iron-Alloys (Die Bestimmung des Siliziums in Ferrosilizium und sonstigen Ferrolegierungen). A. Stadeler, Archiv. Eisenhuettenwesen, Jan. 1929, pp. 425-437.

Critical investigation of the methods for determining the silicon in low, medium and high percent Ferrosilicon, ferrochrome, ferromolybdenum, ferrovanadium, ferrotitanium, ferrotungsten, ferrophosphous, silico-manganese, silico-aluminum.

Spring Manometers and Thermometers (Federmanometer und Thermometer). D. Wohlfarth, Messtechnik, Dec. 22, 1928, pp. 319-324.

Continued from the September 1928 issue. This concluding installment covers the property of the spring manometer accuracy, increase of the durability of highly stressed steel tube springs by a systematic choice of the material or by increasing the length of the spring, working of the spring thermometer, compensation arrangement, description of recorders, critcism of instruments with the recorder drum and use of recorders.

The Strength and Toughness of Ferrous Metals. Research Group News, Jan. 1929, pp. 205-219.

Physical properties are briefly discussed and the various tests are mentioned.—M.B.R.

The Operation of the Engler Viscosimeter (Ueber die Handhabung des Englerschen Zaehigkeitsmessers). S. Erk, Gl. Appar., Jan. 1929, pp. 1-2.

The measurement of volume and temperature are discussed.

On the Government Testing of Thermometers in Germany (Ueber die Amtliche Pruefung der Thermometer in Deutschland). Gl. Appar., Jan. 1929, p. 3.

The procedure is briefly given and the limits of error listed.

Distribution of Heat Between the Ingot and Mold Walls (Ueber den Waermeausgleich zwischen Black und Kokillenwandung). B. Matuschka, Archiv Eisenhuettenwesen, Jan. 1929, pp. 405-413.

The test arrangement and results are given.

Methods for the Exact Measurement of Technical Frequencies. G. Keinath, Siemens Zs., Dec. 1928, pp. 731-736.

After a brief consideration of the Leeds & Northrup Frequency meter the Keinath instrument is illustrated and described.

The Voltage Detector (Der Spannungsucher). O. Spiess, Siemens Zs., Dec. 1928, pp. 741-743.

This article describes an instrument which can be used for the finding of buried cables carrying current, the location of a certain cable among a number in a trench, etc.

The New Oil Testing Apparatus of Siemens and Halske (Die neue Oelpruefeinrichtung der Siemens and Halske). Siemens Zs., Dec. 1928, pp. 743-744.

The apparatus is described and illustrated.

The Interpolator (Der Interpolator). K. Sturm, Zs. Vermess, Jan. 1, 1929, pp. 10-11.

This apparatus is designed as an aid for the uniform distribution of deviations and differences.

Methods for the Determination of Elastic Constants (Methoden ur Ermittlung der Elastizitaeskonstanten). H. Steuding, Mestechnik, Dec. 22, 1928, pp. 324-332.

Continued from the October 1928 issue. General discussion of the elastic constants. Methods are given.

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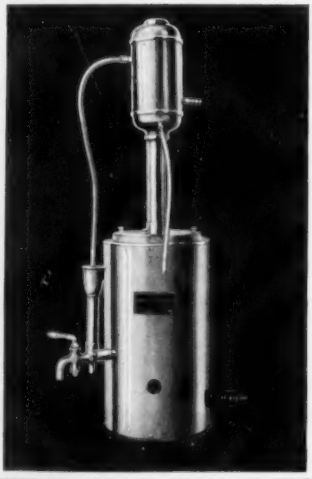

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The Weisbach-Lingke Magnet Theodolite (Der Magnettheodolit Weisbach-Lingke). K. Luedeman, Allegem. Ver. Nach., Jan. 16, 1929, pp. 37-42.

This article is one of a series of a historical nature. The Weisbach-Lingke Theodolite is illustrated and described.

Nadir Triangulation (Nadirtriangulierung). J. Koppmair, Allgem. Ver. Nach., Jan. 16, 1929, pp. 33-37.

Mathematical discussion.

The Electric Ring Tube Distance Transmitting System (Die elektrische Ringrohrfernuebertragung). H. Lohmann and C. Sieber, Siemens Zs., Dec. 1928, pp. 716-725.

After a brief discussion of the measurements, the ring tube and ring tube system, and the construction of the ring tube system is given.

Information on Optical Measurement and the Bosshardtzeiss Reduction Tachymeter (Wirtschaftliches ueber optische messung und das Bosshardt-Zeiss 'sche Reduktions-Tachymeter). Zs. Vermess, Jan. 15, 1929, pp. 45-50.

The operation of the instrument is given and the construction briefly given.

Viscosity of Diesel Lubricating Oils. Oil Engine Power Plant Handbook, 1928, pp. 114-117.

The Engler, Redwood and Saybolt Viscosimeters are described.—M.B.R.

Precision Leveling of High Accuracy with the Zeiss Instrument (Feineinwaegungen von hoher Genauigkeit mit Zeiss 'schem Geraet). O. Niemczyk, Zs. Vermess, Sept. 15, 1928, pp. 561-570.

The running of a line of levels between Berlin and Frankfurt is described.

Review of the Literature for Surveying Measurements of the Year 1927 (Uebersicht der Literatur fuer Vermessungswesen vom Jahre 1927). E. Harbert, E. Brennecke, O. Eggert and O. Gruber. Zs. Vermess., Dec. 15, 1928, pp. 771-803.

A list of references for 1927 is given.

Coefficients of Flow in Concrete Pipe. F. Scobey, Jl. Amer. Waterw. Ass., Jan. 1929, pp. 1-39.

The article briefly considers the use of concrete for pipes. Discusses capacity formulas and gives experimental data on flow of water in concrete pipes.

Scratch Hardness Tests of Ceramic Materials. Louis Navias, Jl. Amer. Ceram. Soc., Feb. 1929, pp. 69-74.

Three sets of standards were prepared: (1) a set of minerals according to Mohrs' Scale, (2) a set of steel samples, and (3) a set of carboloy samples. The sets of standards were compared with each other according to their scratch hardness. Specimens of ceramic materials were then measured for scratch hardness with each set of standards. The results are compared.—M.B.R.

Volt-Ampere Measurement. John Auchincloss, G. E. Rev., Feb. 1929, pp. 103-106.

This article describes the adaptation of standard integrating wattmeter to volt-ampere measurement. The influence of leading and lagging power-factor and phase sequence is discussed.—M.B.R.

Additions to the Theory and Practice of Gloss Measurement (Zur Theorie und Praxis der Glanzmessung). R. Kempf and J. Fluegge, Zs. Instrument, Jan. 1929, pp. 1-25.

The first section of this article which appears in this issue discusses definitions and methods of measuring gloss used heretofore. The subjects taken up are: Theoretical basis of reflection and gloss; gloss as an optical-physiological phenomenon; the factors which determine gloss; the measurement of gloss; the technical meaning of "objective" gloss degree; the degnition of gloss used heretofore; gloss measurements on translucent dull mediums.

The Hugershoff-Heyde Autotachygraph (Der Autotachygraph von Hugershoff-Heyde). P. Werkmeister, Zs. Instrument, Jan. 1929, pp. 25-27.

A brief description of the instrument.

Idiosyncracies of Valve Mechanisms and Their Causes. F. Jehle and W. Spiller, Jl. S. A. E., Feb. 1929, pp. 133-143.

This article describes four different methods of investigating valve behavior. In each case the instruments developed are described.

Fluidity and Other Properties of Aviation Engine Oils. E. Lederer and F. R. Staley, Jl. S. A. E., Feb. 1929, pp. 149-154.

A fluidity measuring machine is described and illustrated.

The Calorific Value of Coal. Engg. Boiler House Rev., Jan. 1929, pp. 366-370.

The use of a number of calorimeters is taken up.—M.B.R.

The Investigation of the Photometric Wedge (Ueber die Untersuchung des photometrischen Keils). W. Sharonow, Zs. Instrument, Jan. 1929, pp. 27-33.

A mathematical consideration.

Use of the Schlieren Method for the Dark Field Illumination of the Microscope (Arwendung der Schlieren methode zur Dunkelfeldbeleuchtung bei Mikroskopen). W. Kraemer, Jan. 1929, pp. 33-36.

A method for dark field illumination is described.

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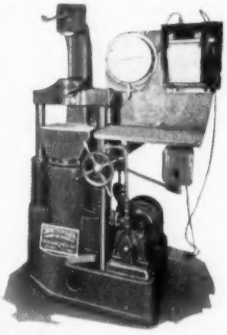

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Some New Laboratory Work on Rubber. A. A. Sommerville and J. M. Ball, Rubber Age, Feb. 10, 1929, pp. 490-492.

Paper read before the New England Section, American Chemical Society. It considers the change in physical properties of rubber when replacing sulpher by selenium.—M.B.R.

A Method of Measuring Color in Bread. Emily Grewe, W. K. Marshall and C. G. Harrel. Cereal Chemistry, Jan. 1929, pp. 60-68.

The use of the Munsell color system for the measurement of color of crust and crumb of bread is discussed.—M.B.R.

A Modified Colorimeter for the Determination of Hydrogen Concentration. J. J. Beaver, Jl. Opt. Soc., Jan. 1929, pp. 41-49.

A calorimeter built by the Klett Manufacturing Company is described and the method of using the instrument is given.—M.B.R.

A Vacuum Tube Circuit for Measuring Small Alternating Currents. R. Martin, Jl. Opt. Soc., Jan. 1929, pp. 58-61.

A set-up of four vacuum tubes, type UX201A, and a D'Arsonval galvanometer is described. Results show the arrangement will measure these currents at low frequencies accurately and at high frequencies the error will be only a few percent, when the proper corrections are made even though the calibration is carried out at low frequencies and for relatively high currents.—M.B.R.

Physical Methods in the Chemical Laboratory. V—Production and Measurement of High Temperatures. E. Schroer, Zs. Angew. Chemie., July 14, 1928, pp. 757-760.

The author reviews the various methods by which high temperatures are produced. Under the heading of chemical reaction methods various gaseous reactions are given and also the Goldschmidt reaction. High temperatures may be attained through use of electrical energy—conduction, induction, cathode ray, and arc—methods. The various methods of measuring temperatures of various ranges have been discussed briefly. Some of the methods are gas thermometry, thermometry, thermocouple, radiation pyrometry, measurement of evaporation-velocity of electrons, and measurement of temperature at which the atoms begin to ionize.—Abs. Bull. Kodak Res. Labs.

Application of Photo-electric Spectophotometry to Microanalysis. H. V. Halban and E. Zimpelmann, Zs. Elektrochem., Aug. 1928, pp. 387-393.

The authors were able by the method described to determine 0.001 mg. iron or 0.01 mg. titanium in 50 c.c. of solution, to within 1%. They were able to detect 0.00002 mg. iron or 0.0001 mg. titanium.—Abs. Bull. Kodak Res. Labs.

Reflecting Power of Beryllium, Chromium and Several Other Metals. W. Coblentz and R. Stair, B. of S. Jl. of Res., Feb. 1929, pp. 343-354.

The apparatus and procedure is briefly described and results obtained are given.—M.B.R.

Laboratory Corrosion Tests of Mild Steel, with Special Reference to Ship Plate. H. Rawdon, B. of S. Jl. of Res., Feb. 1929, pp. 431-440.

Prompted by the claim that the ship plates of the Leviathan have shown evidence in service of outstanding superior corrosion resistance, a series of corrosion tests of mild steels including some Leviathan and other ship plate, was made by the wet-and-dry and the continuous-immersion methods in sea-salt solutions. The steels varied in copper content from a trace to over 0.60 per cent. No differences in corrosion rate were obtained, indicating marked superior corrosion resistance of any of the compositions used. The differences in corrosion behavior observed were those resulting from difference in the test methods employed. The corrosion rate in the wet-and-dry test decreased as the surface film was built up but was always much higher than that for simple immersions. The laboratory test results have not confirmed in any way whatsoever the claims made for the Leviathan plate for unusual superior corrosion resistance.

A Technical Method of Using the Mercury Arc to Obtain Data at Wave Length 560 mu in the Spectrophotometric Analysis of Sugar Products. H. H. Peters and F. P. Phelps. B. of S. Jl. of Res., Feb. 1929, pp. 335-342.

From the data on 40 representative cane sugar products it is shown that the specific absorptive index, -log t, of these products for wave length 560 mu may be calculated with sufficient exactness for all ordinary purposes by deducting 48 per cent of the difference between the values of -log t_{546} and -log t_{578} from -log t_{546}. This interpolation permits the use of the mercury vapor lamp with spectral filters as the source of light for making routine spectrophotometric measurements on technical sugar product, thereby making possible the use of the spectrophotometric method of determining the color of sugar products in many instances where an elaborate spectrophotometer is not available.

Investigation of Holes for Straightness of their Axes (Untersuchung von Bohrungen auf Flucht ihrer Achsen). Dr. Schlippe, Messtechnik, Jan. 22, 1929, pp. 1-8.

It was thought that in holes finished with steel balls (Pressfinish Method) that the ball in passing through the hole deviated sidewards from the axis of the hole. Two methods are given for measuring the deviations of hollow cylinder mantel lines from the ideal straight line parallel to the axis.

Instrument to Measure the Cross-Sectional Changes of Loaded Rods (Apparat zur Messung der Querschnittsaenderungen belasteter Staebe). H. Siegler-schmidt, Messtechnik, Jan. 22, 1929, pp. 8-13.

Description of a new device for measuring the cross-sectional contraction and the standardizing apparatus belonging thereto. Results of several tests with steel rods are given.

X-Ray Applications in Every-Day Life. G. Clark, Scientific Monthly, Feb. 1929, pp. 172-178.
Applications briefly discussed.—M.B.R.

Equipment for Measuring Lightning Voltages. E. Beck, Scientific Monthly, Feb. 1929, pp. 179-182.
The Norinder Cathode Ray Oscillograph is described.—M.B.R.

Some Oscillograph Tests on Electric Starters for Motor Cars. R. L. Smith-Rose and R. S. Spilsbury, Jl. Inst. Elect. Engrs., Jan. 1929, pp. 133-141.
This paper describes an investigation of the operating current of the electric motors ordinarily used for starting motor engines. The standard type of Duddell oscillograph was used to record the starter current and the voltage at the terminals of the car battery respectively.

A New Type of Fine Adjustment for the Microscope Stage (Ueber eine neuartige Feinbewegung fuer Mikroskopstative). Karl John, Jan. 1929, pp. 36-40.
New arrangement briefly described.

A Simple Comparator for Stadia Rods. (Ein einfacher Komparator fuer Massstabsvergleichungen.) Zs. Vermess. Feb. 1, 1929, pp. 72-73.
Apparatus is briefly described.

Electrical Individual Clocks with Pendulum Drive. (Elektrische Einzeluhren mit Pendelantrieb.) P. Gittinger. Zs. Feinmech. Jan. 18, 1929, pp. 1-5.
Several types are described.

A Natural System for the Analysis and Classification of Paper. A. S. Hammond. Paper Trade Journal, Feb. 14, 1929, pp. 55-59.
A system devised by the author is described.—M.B.R.

Conditions for Lubricating Oils for Steam Turbines. Brown Boveri Review. February 1929, pp. 92-97.
This article gives the specifications for the testing of turbine oils. The Vogel-Ossag viscometer is taken up in some detail.—M.B.R.

The Dines Float Barograph. L. H. Dines. Instrument World. Feb. 1929, pp. 305-307.
Abstract of a paper before the Royal Meteorological Society. The constructional details of the instrument are given.—M.B.R.

Ultra-Violet Microscopy. Instrument World, Feb. 1929, p. 307.
Abstract of a paper before the Royal Microscopical Society. The difficulties of ultra-violet microscopy are discussed.—M.B.R.

How to Connect and Use Electrical Testing Instruments. E. S. Lincoln. Industrial Engg., Feb. 1929, pp. 89-93.
In this article the author discusses the proper methods of connecting and using the measuring instruments that are ordinarily employed in industrial work.

A Thread Recorder used as an Ammeter and Voltmeter. A. L. Thorogood. Jl. Sci. Insts., Jan. 1929, pp. 23-24.
The adaptation of a Cambridge Instrument Company's double thread recorder for recording amperage and voltage is described.—M.B.R.

A Frequency Meter for X-Ray Apparatus. F. Bratt. Jl. Sci-Insts., Jan. 1929, pp. 24-25.
An instrument to test the accuracy of the time-switches used on present-day X-ray apparatus for controlling the duration of exposure is described.—M.B.R.

Portable Dynamic Balancing Outfit. P. Davey. Iron Age. Feb. 28, 1929, pp. 610-612.
This article describes an instrument which makes use of the stroboscopic principle to explore vibration in machines. Both static and dynamic unbalance is covered.—M.B.R.

Uses of Radio as an Aid to Air Navigation. J. H. Dellinger. Jl. A.I.E.E., Feb. 1929, pp. 105-109.
A directive radio beacon system is described together with a receiving system which gives simple and direct visual indications of the location of the airplane.

A Precision Regulator for Alternating Voltage. H. M. Stoller and J. Power. Jl. A.I.E.E., Feb. 1929, pp. 110-113.
A recently developed precision voltage regulator for use with alternating current is described. It will maintain its output voltage constant to within 0.03 per cent over an input voltage range of 10 per cent and a load range of from zero to full load. This regulation is accomplished by means of a small transformer inserted in one of the lines which boosts or bucks the impressed voltage by the required amount.—M.B.R.

Use of the Oscillograph for Measuring Non-Electrical Quantities. D. Miner and W. Batten. Jl. A.I.E.E., Feb. 1929, pp. 126-129.
Several typical applications are described showing how motion, time, stress, pressure, etc., are measured.—M.B.R.

Electrical Instruments Used in the Measurement of Flow. W. Pratt. Jl. A.I.E.E., Feb. 1929, pp. 142-146.
This paper outlines some important flow-measurement problems and points out the character of electrical apparatus that may be used with other equipment for measuring flow.—M.B.R.

Review of Recent Patents

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ENGLISH—Send request to His Majesty's Stationery Office Press, Pocock St., S.E.1, London, England, enclosing 1 shilling for each patent.
GERMAN—Send request to Reichspatentamt, Berlin, Germany, enclosing 1 reichsmark for each patent.

United States Patents

TANK DISCHARGE-CONTROLLING MECHANISM. N. Carlson, Erie, Pa. Pat. No. 1,694,407.

TIME SWITCH. H. Kempf. New York, N. Y. Pat. No. 1,694,472.

PRESSURE AND TEMPERATURE CONTROL VALVE. H. Tabler, St. Louis, Mo. Pat. No. 1,694,492.

TENSIOMETER. W. Klemperer, Akron, Ohio. Pat. No. 1,694,509.

AUTOMATIC TEMPERATURE CONTROLLING DEVICE FOR INCUBATORS. P. Stover, Harrisonburg, Va. Pat. No. 1,694,513.

BATTERY WATER LEVEL INDICATOR. L. R. Willits, Atlantic City, N. J. Pat. No. 1,694,609.

SPEED REGULATOR. J. Bethenod, Paris, France. Pat. No. 1,694,637.

SCALE INDICATOR. Olaf Johnson, Minneapolis, Minn. Pat. No. 1,694,658.

ELECTROLYTIC LEVEL GAUGE. T. McCartie, Newark, N. J. Pat. No. 1,694,687.

DYNAMIC AND EFFICIENCY METER. E. Peters, Crefeld, Germany. Pat. No. 1,694,718.

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THERMOSTATIC CONTROL OF CARBURETORS. A. Taub, Detroit, Mich. Pat. No. 1,694,759.

HEAT INDICATOR FOR INTERNAL COMBUSTION ENGINES. L. Spencer, Detroit, Mich. Pat. No. 1,694,871.

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DEPTH MEASURING DEVICE. G. Smith, Sistersville, W. Va. Pat. No. 1,695,033.

ELECTRIC REGULATOR. H. Stoller, Mountain Lakes, N. J. Pat. No. 1,695,035.

TESTING APPARATUS. C. Heppensteel, Elizabeth, N. J. Pat. No. 1,695,046.

THERMOELECTRIC SWITCH. A. V. Hook, New Washington, Ohio. Pat. No. 1,695,103.

AUTOMATIC DRAFT REGULATOR FOR BOILERS. Andre M. Mertzanoff, New York, N. Y. Pat. No. 1,695,240.

AUTOMATIC DRAFT REGULATOR FOR BOILERS. L. Eggleston, Buffalo, N. Y. Pat. Nos. 1,695,241-3.

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TEMPERATURE INDICATOR. E. Rollins, Roxbury, Mass. Pat. No. 1,695,295.

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METAL TESTING APPARATUS. G. Collins, Port Arthur, Texas. Pat. No. 1,695,367.

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WHEATSTONE BRIDGE METER SYSTEM. T. Harrison, Philadelphia, Pa. Pat. No. 1,695,424.

COMBUSTION CONTROL IN STEAM BOILER FURNACES. F. Linley, Duluth, Minn. Pat. No. 1,695,431.

GASOLINE-DISPENSING DEVICE. I. Newton, St. Paul, Minn. Pat. No. 1,695,436.

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MEANS FOR REGULATING COMBUSTION. E. Roucka, Blansko, Czechoslovakia. Pat. No. 1,695,470.

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PRESSURE AND TEMPERATURE CHANGE RESPONSIVE FURNACE CONTROL MEANS. C. Quinn, San Francisco, Calif. Pat. No. 1,695,606.

COMPUTING SCALE. C. van Berkel, Wassenaar, Netherlands. Pat. No. 1,695,620.

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SOUNDING DEVICE FOR LIQUID LEVELS. L. Steiner, Berlin, Germany. Pat. No. 1,695,703.

OSCILLOGRAPH. R. Ruedenberg, Berlin, Germany. Pat. No. 1,695,719.

AUTOMATIC HEAT CONTROLLING REGULATOR. J. Lawler, Mount Vernon, N. Y. Pat. No. 1,695,809.

TEMPERATURE INDICATING MECHANISM. S. Barker, Chicago, Ill. Pat. No. 1,695,838.

LIQUID LEVEL CONTROL. L. Harding, Brooklyn, N. Y. Pat. No. 1,695,846.

Study of Weller Brittleness Test for Paper. R. Peek and J. Finch. Paper Trade Journal, February 7, 1929, pp. 56-62.

Experimental data are presented which show that the effect of the sample dimensions and the conditions of testing are substantially as indicated by the theoretical expression. The theory is then employed to interpret the results of the test and to indicate the best form in which these may be expressed. The general question of testing for flexibility and brittleness is considered in the light of this study.—M.B.R.

Graphic Instruments Search Out Power Faults. R. S. Wertheimer and W. D. Riggs. Power, Feb. 19, 1929, pp. 306-308.

The graphic electric instrument equipment of the Longview Fibre Company is described. The uses and some of the results obtained with the instruments are given.

Totalizing of Electric System Loads. P. M. Lincoln. Jl. A.I.E.E., Feb. 1929, pp. 129-133.

The importance of measuring an electric system load at any distance from that load is emphasized. The use of thermal wattmeters in conjunction with thermal couples is suggested. Time of response of such devices is discussed; temperatures attained are also discussed. Characteristics of circuits for transmitting the thermal e.m.f. from the load to the point of measurement are discussed in detail. A list of users, together with data pertaining to the measurement-transmitting circuits is given.

Automatic Frequency Control. R. Brandt. El. World. Feb. 23, 1929, pp. 385-388.

This article gives the underlying operating requirements.

Switchboard Instruments. E. Banner. El. Rev., Feb. 8, 1929, pp. 231-232.

A review of modern practice in the design and use of indicating electrical equipment.

Photometry of Therapeutic Lamps. D. T. Harris. Jl. Sci. Insts., Jan. 1929, pp. 1-7.

A rapid method of measuring the ultra violet emission from luminous sources is described, involving the use of a photo-electric cell, thermionic valve and a micro-ammeter.—M.B.R.

A Special Multiple Extensometer for Measuring the Shrinkage and Adhesion Stresses between Concrete and Steel. W. Glanville. Jl. Sci. Insts., Jan. 1929, pp. 7-10.

In place of the steel bar normally used in adhesion testing the instrument makes use of a steel tube, thus enabling points of reference to be fixed internally. Strains are measured by the rotation of rollers to which small mirrors are attached. The form of the load distributions, due to the shrinkage of the concrete and to the pulling out of the trek in a testing machine, is given for two typical cases.—M.B.R.

An Electrically Maintained Tuning Fork with a Calibrated Speed Adjustment. D. C. Gall. Jl. Sci. Insts., Jan. 1929, pp. 18-19 .

Instrument manufactured by H. Tensley & Co., illustrated and briefly described.—M.B.R.

An Acoustic Laboratory for the Testing of Music and other Steel Wires. W. White. Yearbook. Amer. Iron & Steel Inst., 1928, pp. 287-306.

The work of the laboratory, the equipment and results of some of the researches are discussed.

Uniformity, Continuity and Magnetic Testing. A. V. de Forest. Yearbook. Amer. Iron & Steel Inst., 1928, pp. 307-311.

A discussion of the factors entering into the determination of physical properties.

Non-Destructive Detection of Hidden Flaws. E. Sperry. Yearbook. Amer. Iron & Steel Inst., 1928, pp. 312-349.

The Sperry apparatus is described and its application discussed. An appendix to the paper covers transverse fissure detecting devices.

Remarks on the Determination of Hydrogen and Methane in the Orsat Apparatus. (Bermerkungen zur Wasserstoff-und Methanbestimmung im Orsat-Apparat). H. Bahr. Achiv fuer Eisenhuettenwesen. Feb. 1929, pp. 495-502.

This article gives the possibility of errors when analyzing gas with the usual Orsat Apparatus. It further discusses the oxidation possibility of the hard rubber insulation and of the mercury, the absorption of the carbon dioxide by the liquid in the combustion pipette. Special non-oxidizable types of electrode. The use of a salt solution as sealing liquid. Permanent Orsat apparatus with the possibility of separate and simultaneous combustion of the hydrogen and methane.

Temperature Control in Vulcanizers. C. B. Mitchella. Rubber Age. Feb. 25, 1929, pp. 547-548.

Various practices of temperature control beyond the scope of automatic controls are reviewed. Many unusual vulcanizer conditions exist making special applications necessary.—M.B.R.

New Machine for Testing Tires. Rubber Age, Feb. 25, 1929, p. 550.

A machine developed by the Research Department of the Dunlop Rubber Co., Ltd., England, for the testing of tires is briefly described.—M.B.R.

PHASE INDICATOR AND METHOD OF DETERMINING THE PHASE RELATION OF A.C. W. Kates, Philadelphia, Pa. Pat. No. 1,695,850.

TEMPERATURE CONTROL SYSTEM. R. Lincoln, Wilkinsburg, Pa. Pat. No. 1,695,853.

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BALANCING MACHINE. C. Soderberg, Edgewood, Pa. Pat. No. 1,695,904.

ELECTRICAL MEASURING INSTRUMENT. F. Conrad, Pittsburgh, Pa. Pat. No. 1,695,917.

METHOD OF AND APPARATUS FOR INTERCONNECTING AND TESTING ELECTRICAL APPARATUS. W. Ray, Chicago, Ill. Pat. No. 1,696,012.

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METHOD OF TESTING STORAGE BATTERIES. H. I. Shire, Detroit, Mich. Pat. No. 1,696,334.

LIQUID LEVEL GAUGE. Henry Ford, Dearborn, Mich. Pat. No. 1,696,347.

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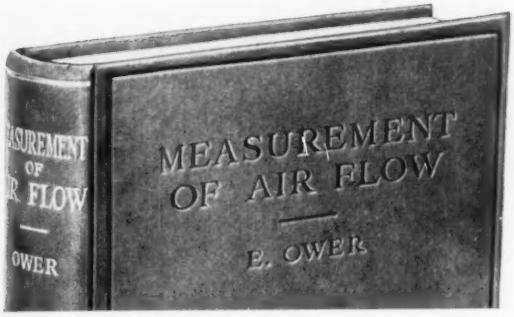

The Measurement of Air Flow

By

E. Ower, B.Sc. (Lond.), Hons. I., A.C.G.I.

Bramwell Medallist; Member of the Institute of Heating and Ventilating Engineers; Assistant in the Aerodynamics Department, National Physical Laboratory.

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PREFER BLONDS—BRUNETS OUT OF LUCK WITH INSTRUMENT MAKERS

Baltimore, Md., March 9.—Apparently, scientists as well as "gentlemen prefer blonds."

And even though many airplane pilots prefer brunets, many of them—knowingly or not—carry a strand of flaxen hair on their flights into the upper regions. For though this strand of flaxen hair may or may not appeal to their aesthetic taste, it serves them all a very practical purpose, according to Lucien L. Friez, president of Julien P. Friez & Sons, the manufacturing and research division of the Consolidated Instrument Co. of America, Inc.

Encased in every aero-meterograph instrument carried aboard a plane to record barometric pressure, temperature and humidity, is a strand of this type of hair from the human head, which records the moisture beneath the distant stars. Only fair, shining locks of natural blond heritage are employed; all brunets are barred en masse.—Pittsburgh Press.

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PORTABLE ELECTRICAL INSTRUMENTS.

W. J. HEALEY, INSTRUMENTS, Vol. 2, No. 3, March 1929, pp. 79-83, 9 figs.

This article considers the following points in reference to portable instruments: accuracy, application, and construction.

THE OSTWALD COLOR THEORY.

ALBERT PARSONS SACHS, INSTRUMENTS, Vol. 2, No. 3, March 1929, pp. 85-89, 6 figs.

Continued from the February issue. This installment describes a method of naming and measuring grays accurately. White, black and gray are defined. The gray ladder on which the Oswald Color Theory is based is considered.

THE WILIP-GALITZIN SEISMOGRAPH.

J. W. TYMAN, S.J., INSTRUMENTS, Vol. 2, No. 3, March 1929, pp. 91-94, 4 figs.

The seismograph is described and illustrated. The differences between this and the older type are pointed out.

INTEGRATION OF "ORIFICE HEAD" CHARTS BY MEANS OF SPECIAL PLANIMETERS.

JOHN L. HODGSON, INSTRUMENTS, Vol. 2, No. 3, March 1929, pp. 95-97, 2 figs.

This article describes two special planimeters which enable obtaining the flow with accuracy from "orifice head" charts in cases where the recorded orifice head fluctuated considerably.

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